Ohio Examinations and Answers

Vol. 3. 1906.

Helen Fagan

H. C. Bottume

1909

OHIO

Examinations and Answers

FOR 1906-07

Containing Complete Discussions of the Questions Used in the Teachers' Examinations for the Year Ending August, 1907.

EDITED AND COMPILED BY

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ATHENS, OHIO:
PUBLISHED BY THE OHIO TEACHER.
1908

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1907

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OHIO EXAMINATIONS AND ANSWERS

FOR

ELEMENTARY CERTIFICATES FOR 1906-07

GRAMMAR.

Answers by Hiram Roy Wilson, A. M., Professor of English,
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AUGUST, 1906.

The burden put upon the President by persistent office-seekers and by members of Congress striving to reward their friends in the effort to secure nominations is almost past mortal endurance and undoubtedly conflicts with the higher duties he owes to the whole people and deprives him of much of the opportunity he should have to consider the weighty matters of general concern. Nor is it the least cause of much interested dissatisfaction and unjust criticism.—Coleman's "Constitution and Its Framers."

The first seven questions refer to the selection given above.

1. Select all the principal clauses.

Answer.—Principal clauses: "The burden put upon the President by persistent office-seekers, and by members of Congress striving to reward their friends, in the effort to secure nominations, is almost past mortal endurance, and undoubtedly conflicts with the higher duties, and deprives him of much of the opportunity."

2. Classify all of the subordinate clauses, as adjective, objective or adverbial.

Answer.—Adjective clauses: "he owes to the whole peo-

ple"; "he should have to consider the weighty matters of general concern."

3. Dispose of three infinitives.

Answer.—"To reward" is an infinitive phrase from **reward;** parts, present indic., **reward,** past, **rewarded,** past par., **rewarded;** transitive, active; the phrase is used as an adverbial element of purpose limiting **striving.** "to secure" is from the regular verb **secure;** parts, present indic., **secure,** past, **secured,** past par., **secured;** transitive, active; the phrase is used as an adjective element limiting **effort.** "to consider" is from the regular verb **consider;** parts, present indic., **consider,** past, **considered,** past par., **considered;** transitive, active; the phrase is used as an adverbial element of purpose limiting **should have.**

4. Compare **persistent, higher, whole, much** and **least.**

Answer.—Positive, **persistent, high, much, little;** comparative, **more** or **less persistent, higher, more, less;** superlative, **most** or **least persistent, highest, most, least.** Usually **whole** is not compared.

5. Parse a participle; a verb in the potential mood; an adverb of degree.

Answer.—**put** is a participle from **put; put** is an irregular verb; parts, present indic., **put,** past, **put,** past par., **put;** transitive, passive; **put** is used as an adjective element limiting **burden. should have** is a verb, irregular; parts, present, **have,** past, **had,** past par., **had;** transitive active, potential, past tense; third person, singular, to agree with **oe. almost** is an adverb of degree, incomparable, limits **past.**

6. Give the construction of **past, in** and **endurance.**

Answer.—**past** is a preposition showing the relation between its object **endurance** and **is;** the phrase limits **is.** Some writers would use **past endurance** as an attribute complement; still **past** retains its prepositional use with **endurance** as object. **in** is a preposition showing relationship between its object **effort** and the past participle **put. endurance** is a noun, common; neuter, third, singular, objective case as object of **past.**

7. What is the mood and tense of **should have?** Complete its conjugation in the same tense.

Answer.—(a) See answer to number 5. (b) (1) (I) **should have.** (2) (Thou) **shouldst have.** (You) **should have,** (3) (He) **should have.** (1) (We) should have. (2) (You) **should have.** (3) (They) **should have.**

8. Write a sentence containing an appositive clause; but used as an adverb; an independent construction with a participle.

Answer.—(a) It has been decided **that he must go.** (b) He has **but** to try. (c) **Night coming on,** the army withdrew.

SEPTEMBER, 1906.

And while in life's late afternoon,
  Where cool and long the shadows grow,
I walk to meet the night that soon
  Shall shape and shadow overflow,
I cannot feel that thou art far,
  Since near at hand the angels are;
And when the sunset gates unbar,
  Shall I not see thee waiting stand,
And, white against the evening star,
  The welcome of thy beckoning hand?

—Whittier.

Note.—The first six questions refer to the selection given above.

1. With regard to the following connectives, write the clause that each introduces and the word with which it connects that clause: while (1), where (2), that (3), since (6), when (7).

Answer.—**while** introduces the clauses in lines 1, 2, 3, 4, and joins this complex clause to **can feel.** **where** introduces the clause in l. 3, and connects the clause with **afternoon; where** itself modifies **grow.** **that** is the subject of the clause, **that . . overflow,** which it joins to **night.** **since** introduces the clause in l. 6, and joins it to **can feel.** **when** introduces the clause in l. 7, and joins it to **shall see.**

2. Name and classify all objective elements.

Answer.—**afternoon, night, shape, shadow, hand** (l. 6), **thee, white, star, welcome,** hand (l. 10), are used as objective elements of the first class. **stand** is an objective ele-

ment of the second class. "that thou art far" is an objective element of the third class.

3. Select two principal clauses.

Answer.—"I cannot feel" and lines 8, 9, 10.

4. Give the syntax of one infinitive; one participle.

Answer.—**to meet** is an adverbial modifier of **walk**; **waiting** is an adjective participle used as an attribute after **stand.**

5. Name all of the conjunctive adverbs. Classify all other adverbs according to meaning.

Answer.—**while** and **when** are conjunctive adverbs of time; **where,** of place. **not,** negative, modal; **far,** place; **near,** place. By some, these last two adverbs would be called in this construction mere adjectives.

6. Parse shall see (8); stand (8); against (9).

Answer.—**shall see** is a verb, irregular; parts, present, **see,** past, **saw,** past part., **seen**; transitive, active; indicative, future; first person, singular, to agree with **I. stand** is an infinitive from **stand,** an irregular verb; parts, present, **stand,** past, **stood,** past part., **stood;** intransitive; the infinitive is here used as the infinite form of the verb with **thee** as an objective subject. **against** is a preposition, which shows relation between its object **star** and the adjective **white.**

7. Name three different uses of the nominative case and illustrate each by an original sentence.

Answer.—The nominative case as subject, The **horse** runs; as independent with a participle, The **lessons** having been prepared, the children went out to play; as independent by direct address, **Charles,** come here.

8. Write a sentence containing:

a A verb in the progressive form;

b A copulative conjunction;

c A descriptive adjective used as a noun;

d A clause in apposition with a noun;

e A passive infinitive as the subject of a finite verb.

Answer.—a. It **is raining.** b. John **and** James will go. c. The fact **that he did that** is sufficient evidence. e. **To be misunderstood** is often unpleasant.

OCTOBER, 1906.

It should go without saying that a librarian should possess a wide knowledge of books. Since his work brings him into relation with the boundless domain of human knowledge, no librarian can know too much. He should, also, be one who has had the benefit of a thorough preliminary training; for any attempt on the part of a novice to undertake the work, is sure to result only in disappointment and failure. No one who has read little or nothing but novels since leaving school need ever hope to succeed as a librarian.

The first eight questions refer to the selection given above.

1. Diagram the first sentence.

Answer.—It is the subject of the principal clause; **should go,** the predicate, is modified by the prepositional phrase **without saying; saying** is a verbal noun. **librarian** is the subject of the subordinate clause, which is nounal, being used in apposition with **It; should possess** is the incomplete predicate; **knowledge**, the object complement. **librarian** is modified by **a,** an adjective element; **knowledge,** by **a, wide,** and **of books,** adjective elements. **that** is a conjunction introducing the noun clause.

2. Classify the seven clauses of the sentences that follow as subject, object or adverbial. Beside each adverbial clause, write the word it modifies.

Answer.—"Since . . . knowledge," an adverbial clause, limits **can know;** "who . . . training" is an adjective clause; "who . . . school" is an adjective clause. The other clauses are independent, or principal clauses.

3. Give the syntax of three infinitives.

Answer.—to undertake is an adjective modifier **of attempt; to result,** an adverbial modifier of **sure; to hope,** the object of **need.**

4. Classify all the adverbs contained in the selection.

Answer.—much, too, are adverbs of degree; **also,** intensive; **ever,** time.

5. Distinguish between conjunctive adverbs and subordinate conjunctions. Point out an example of each in the above selection.

Answer.—A subordinate conjunction is one that connects elements of unequal rank. A conjunctive adverb performs the office of a subordinate conjunction, and also modifies as an adverb. **Since,** sentence 2, is a subordinate conjunction; there is no conjunctive adverb in the selection.

6. How many and what classes of pronouns are represented in the selection?

Answer.—Personal, relative, and adjective pronouns occur in the excerpt.

7. Select verbs in the subjunctive mood. Compare **wide, boundless** and **sure.**

Answer.—By some writers, **should go, should possess,** and **should be** are treated as subjunctive-mode verbs. It seems preferable to call them potential forms. **wide, wider, widest; sure, surer, surest; boundless** does not admit comparison.

8. Parse all of the substantives in the last sentence.

Answer.—**one** is an adjective pronoun; antecedent, person spoken of; common gender, third person, singular number, nominative case, as the subject of **need. who** is a relative pronoun; antecedent, **one;** with this it agrees in gender, person, and number; nominative case, the subject of **has read. little** and **nothing** are nouns, common; neuter, third, singular, objective case, the objects of **has read. novels** is a noun, common; neuter, third, plural, objective case, the objects of **but. school** is a noun, common; neuter, third, singular, objective case, the object of **leaving. hope** is an infinitive from **hope;** the verb is regular and transitive; the infinitive is used as a noun, common; neuer, third, singular, objective case, the object of **need. to succeed** is an infinitive from **succeed;** regular and intran sitive; it is here used as a noun, common; neuter, third, singular, objective case, the object of **hope. librarian** is a noun, common, third, singular, nominative case in apposition with **one.**

9. Classify adjectives in the selection.

Answer.—a, the, no, any, only, No, preliminary, are definitive adjectives; wide, boundless, human, thorough, sure, are descriptive.

10. Write sentences containing each of the following:

a A participle used as an adjective;
b A participle used as a noun;
c A participle used with a noun in the absolute construction.

Answer.—a. **Hearing** a step, I turned. b. This resulted from his **going** there. c. The chief witness **being** absent, court was dismissed.

NOVEMBER, 1906.

The first six questions are based upon the sentence given below.

Mr. Weller having obtained leave of absence from Mr. Pickwick, who, in his then state of excitement and worry was by no means displeased at being left alone, set forth, long before the appointed hour, and having plenty of time at his disposal, sauntered down as far as the Mansion House, where he paused and contemplated, with a face of great calmness and philosophy, the numerous drivers of stages who assemble near that famous place of resort, to the great terror and confusion of the old-lady population of these realms.—Dickens.

1. Point out and classify principal and subordinate clauses.

Answer.—Principal clause: "Mr. Weller, having obtained leave of absence from Mr. Pickwick, set forth, long before the appointed hour, and having plenty of time at his disposal, sauntered down as far." Subordinate adjective clauses: "who, in his then state of excitement and worry was by no means displeased at being left alone"; "where he paused and contemplated, with a face of great calmness and philosophy, the numerous drivers of stages"; "who assemble near the famous place of resort, to the great terror and confusion of the old-lady population of these realms."

Subordinate adverbial clause: "as the Mansion House [is]."

2. Parse **having obtained** (1); **being left** (4); **having** (5).

Answer.—**Having obtained** is a past participle, regular,

transitive, active; it is an adjective modifier of **Mr. Weller.** **Being left** is a past participle, irregular, transitive, passive; it is used as a noun, common, neuter, third, singular, objective case; the object of **at.** **Having** is a present participle, irregular, transitive, active; it is an adjective modifier of **Mr. Weller.**

3. To what part of speech does each of the following words belong: **leave** (1); **appointed** (5); **plenty** (5); **near** (10); **old-lady** (11)?

Answer.—**Leave,** a noun; **appointed,** an adjective; **plenty,** a noun; **near,** adverb or preposition; **old-lady,** adjective.

4. Select one adverbial phrase (not prepositional). Select and classify, according to meaning, three adverbs.

Answer.—The sentence contains no adverbial **phrase** not prepositional. **Forth,** place; **as,** degree; **far,** place.

42. Give the syntax of **from** (2); **then** (2); **as far as** (6).

Answer.—**From** shows the relation from **Mr. Pickwick** to **having obtained; then** limits **state; as** (1) modifies **far; far. sauntered; as** (2) joins the clause, "the Mansion House [is], to **as** (1) and modifies **is** understood.

5. What classes of connectives are illustrated in the selection?

Answer.—Co-ordinate conjunctions, relative pronouns, conjunctive adverbs.

6. Write all the modifiers of **having obtained** (1); **sauntered** (6); **assemble** (10.

Answer.—**Having obtained** is completed by **leave,** an object; it is modified by **from Mr. Pickwick. Sauntered** is modified by **down** and **far. Assemble** is modified by **near** or **near place** and by **to terror and confusion.**

7. Give a complete classification of pronouns.

Answer.—Pronouns are classified as simple, compound personal, relative, compound relative, interrogative, and adjective. Sometimes the words "demonstrative" and "indefinite" are employed.

8. Write sentences containing:
   a. **After** used as an adjective, an adverb and a preposition;
   b. An adverb of place in the comparative degree;
   c. An independent phrase.

Answer.—a. 1. This was said a moment **after.** 2. He followed **after.** 3. He came **after** me.

b. He stood **farther** away. 3. **To make a long** story **short,** he is the person we seek.

DECEMBER, 1906.

1 Build thee more stately mansions, O my soul,
2 As the swift seasons roll!
3 Leave thy low-vaulted past!
4 Let each new temple, nobler than the last,
5 Shut thee from heaven with a dome more vast,
6 Till thou at length art free,
7 Leaving thine outgrown shell by life's unresting sea!

—Oliver Wendell Holmes.

The first six questions refer to the selection given above.

1. Name all the parts of speech in the English language, and, in the above selection, locate one example of each.

Answer.—Noun, pronoun, verb, adverb, adjective, conjunction, preposition, interjection. **Build,** verb; **thee,** pronoun; **more,** adverb; **stately,** adjective; **mansions,** noun; **As,** conjunction (sub-class, conjunctive adverb); **O,** interjection; **at,** preposition. Some writers on grammar are inclined to exclude the interjection, and to recognize only seven parts of speech.

2. Compare all of the descriptive adjectives.

Answer.—The positive, comparative and superlative degrees of the descriptive adjectives are respectively as follows: **stately, more** or **less stately, most** or **least stately; swift, swifter, swiftest; low-vaulted** usually is not compared; **new, newer, newest; noble, noblest; vast, more** or **less vast, most, more** or **least vast;** or **vast, vaster, vastest; outgrown** and **unresting** are not compared.

3. Locate, as to mood, tense and form, all of the verbs.

Answer.—**Build,** imperative, present, active, common; **roll,** indicative, present, common; **Leave,** imperative, present, active, common; **Let,** imperative, present, active, common; **is** understood (l. 4) indicative, present, common; **art,** indicative, present, solemn.

4. Find one example each of the following classes of elements: Independent, adverbial phrase, adverbial clause.

Answer.—Soul, independent; **at length,** adverbial; 1, 2, adverbial clause.

5-6. Parse: Thee (1), soul (1), as (2), last (4), till (6), leaving (7).

Answer.—Thee is a personal pronoun; intecedent, **soul;** common, second person, singular, objective case, object of a preposition understood. **Soul** is a noun, common; common gender, second person, singular, nominative case, independent by direct address. **As** is a conjunction, subordinate, conjunctive adverb; modifies **Build** and **roll,** and joins its clause to **Build. Last** is an adjective, definitive, incomparable, limits some term understood. **Till** is a conjunction, subordinate, conjunctive adverb; modifies **Shut** and **art,** and joins its clause to **Shut.** It may be parsed as a preposition taking the following clause as of noumal construction used as its object. **Leaving** is a present participle from the transitive, regular verb **leave; leaving** modifies **thou.**

7-8. Define a conjunction adverb; write two sentences containing conjunctive adverbs; make a list of ten conjunctive adverbs.

Answer.—A conjunctive adverb is a word connecting as a conjunction and modifying as an adverb. John came **when** he was called. The wind bloweth **where** it listeth. **When, where, while, since, as, the, than, that, whereby, why.**

9. Write all the participles of bid (to command), lie (to recline), and blow.

Answer.—Present, **bidding, lying, blowing;** past, **bid** or **bidden, being bidden** (progressive passive), **lain, blown, being blown** (progressive passive); past perfect, **having bidden, having been bidden** (passive), **having lain, having blown, having been blown** (passive).

10. State two arguments for and two against the use of diagrams in the analysis of sentences.

Answer.—The diagram assists is cultivating accuracy in analysis by giving the concrete picture; secondly, it presents itself as a whole, showing at once all the sentence constructions in their relationships to one another. Unduly emphasized, the diagram often is taken by the student as

an end in itself; secondly, it may encourage a mental attitude likely to degenerate into a mere mechanical process of thinking.

JANUARY, 1907.

1 The book review is a form of composition
2 increasingly important in this age of reading.
3 We frequently wish to know what books have
4 appeared that are worthy to be read, and what
5 is their character, in order to judge whether
6 they are of the kind to especially appeal to us.
7 To tell just this, clearly and concisely, is the
8 function of the book review.

The first six questions are based upon the selection given above.

1. By reference to the above, illustrate a word, a phrase and a clause element.

Answer.—The, l. 1, is a word element; **of composition,** a phrase element; **that are worthy to be read,** l. 4, clause element.

2-3. Give the construction of five infinitives. Locate one example of an infinitive separated from its sign. Adverbs of which class may properly be placed between the infinitive and its sign?

Answer.—**To know** is used as a noun, the object of **wish; to be read,** an adverbial modifier of **worthy; to judge,** an adjective element modifying **order; to appeal,** an adjective element limiting **kind; To tell** is the subject of the last sentence. **To appeal** is separated by the adverb. By some writers the cleft infinitive frequently is used. Adverbs of manner occasionally are placed between the **to** and the infinitive proper. In English literature, numerous sentences are found wherein several words intervene between the parts of the infinitive phrase proper. The construction is not accepted as the most desirable one.

4. Classify six adverbs and give the complete parsing of the first one found in the selection.

Answer.—**Increasingly,** degree; **frequently,** time; **especially,** manner; **clearly** and **concisely,** manner. The preceding are all the adverbs in the selection. **Increasingly** is

an adverb of degree; it is not compared; positive degree, limits **important.**

5. Dispose of reading (2), important (2), whether (5).

Answer.—**Reading** is a noun, the object of **of. Important** is a descriptive adjective, limiting **form. Whether** is an introductory conjunction, introducing the noun clause following it.

6. With regard to **this** and **what,** state as what parts of speech each is found.

Answer.—**This,** l. 7, is an adjective pronoun. **What,** l. 3, is a definitive adjective, limiting books; **what,** l. 4, an interrogative pronoun in an indirect question.

7. Give a complete classification of conjunctions, with examples of each class.

Answer.—Co-ordinate and subordinate. Under the first head may be given the following sub-classes: copulative, **and;** adversative, **but;** alternative, **or;** a fourth class, illative, is given by some, **hence** being an example. Subordinate conjunctions may denote time, **when;** place, **where;** degree, **than;** manner, **as;** cause, **because;** concession, **though;** condition, **if;** result and purpose, **that.** Sometimes conjunctions used in pairs are called correlatives; as **both . . . and.**

8. a. Give the conjugation of **lie** (to recline) in the past subjunctive, active; also all of its infinitives.

Answer.—a. By some writers **lie** (to recline) has the following conjugation in the past tense:

1.	If I lay.	1. If we lay.
2.	If thou lay.	
	If you lay.	2. If you lay.
3.	If he lay.	3. If they lay.

The verb is intransitive, having no voice. Present, **to lie;** present perfect, **to have lain.**

b. Write sentences containing an example of each of the following: A collective noun; an abstract noun; a noun in the absolute construction.

Answer.—b. The **jury** has agreed. **Truth,** crushed to earth, shall rise again. The **children** having recited, school was dismissed.

FEBRUARY, 1907.

Sir:—I think you must perceive that I am resolved this day to have nothing at all to do with the question of the right of taxation. Some gentlemen startle—but it is true; I put it totally out of the question.—Speech of Conciliation, Burke.

The first six questions refer to the selection given above.

1. Name all phrases and classify them as substantive, adjective or adverbial.

Answer.—Day, with its governing preposition, forms an adverbial phrase; **to have,** adverbial; **at all,** adjective; **to do,** adjective; **of taxation,** adjective; **out of question,** adverbial; **of conciliation,** adjective.

2. Give the antecedents of two personal pronouns of the third person.

Answer.—The antecedent of the first **it** is the statement that he is "resolved . . . taxation." Of the second **it, right of taxation** is the antecedent.

3. Give the mood, tense and voice of all finite verbs.

Answer.—Think, indicative, present, active; **must perceive,** potential, present, active; **am,** indicative, present, neuter; **is,** indicative, present, neuter; **put,** indicative, present, active.

4. Classify the sentences with respect to form and use. Give the construction of **that** and **but.**

Answer.—The first sentence is declarative and complex; the second, declarative and compound. **That** is an introductory conjunction introducing a noun clause; **but** is a coordinate conjunction connecting its member with the one preceding.

5. Parse **Sir, day, at all, totally.**

Answer.—Sir is a common noun; masculine, second, singular; nominative case, independent by direct address. **Day** is a common noun; neuter, third, singular; objective case, used adverbially to denote time, after some preposition understood. **At all** is a prepositional phrase, used as an adjective modifier of **nothing. Totally** is an adverb of degree, incomparable, limits **out of.**

6. Analyze the first sentence by diagram.

Note.—**Am resolved** may be taken together, the equivalent of **have resolved**; then **to have** would be used as the object of the verb.

7. Define syntax, substantive, abstract noun.

Answer.—Syntax treats of the manner in which words are joined in sentences. A substantive is a term filling the office of a noun. An abstract noun is one that names a quality apart from the object in which it is found.

8. Explain the use of the participle in each of the following sentences: (a) By the giving of my usual signal, I dismissed the class; (b) At a given signal, the class was dismissed; (c) A signal being given, the class was dismissed; (d) Giving a signal, I dismissed the class.

Answer.—**Giving** in (a) is a mere noun. **Given** (b) is an adjective. **Being given** (c) is an adjective participle limiting **signal**; the phrase is absolute. **Giving** is an adjective participle limiting **I**.

MARCH, 1907.

1 Looking out, there was scarce anything to
2 be seen but the lashing of the wind and snow,
3 and the men, when they finally attempted to
4 face it to go to the rescue of the cattle over-
5 taken in the field, found the air filled with fine,
6 powderly flakes, mixed with the dirt caught
7 up from the plowed land by a terrific blast
8 which moved almost ninety miles an hour and
9 made it impossible to see twenty yards ahead.

The first seven questions refer to the selection given above.

1. What kind of sentence is the above? Name (as to subject and predicate) all principal clauses. Classify all subordinate clauses.

Answer.—A complex-compound sentence. **Anything** is the subject of the first member; **was**, the verb; **to be seen**, the attribute. **Men** is the subject of the second member; **found**, the verb; **filled**, the objective complement; **air**, the object. "When they finally . . . in the field," is an adverbial clause; "which moved almost ninety miles . . . twenty yards ahead," an adjective clause.

2. Give the syntax of four infinitives.

Answer.—To be seen is used as the attribute after **was; to face** is the object complement of **attempted; to go,** an adverbial modifier of **attempted; to see,** a substantive explanatory of **it.**

3. Point out all the different uses of the participle found in the selection.

Answer.—Looking is independent, and is a hanging participle; **overtaken,** an adjective element, limiting **cattle; filled,** an objective complement; **mixed,** an adjective element, limiting **flakes; caught,** adjective element, limiting **dirt.**

4. Classify six adverbs.

Answer.—Out, place; **there,** independent; **finally,** time; **up,** place; **almost,** degree; **ahead,** place.

5. Parse in full **it** (4) and **it** (9).

Answer.—It is a simple personal pronoun; antecedent, **lashing;** neuter, third, singular, objective case, the object of **to face. It** (l. 9) is a simple personal pronoun, here having an impersonal or idiomatic use; antecedent, the phrase "to see twenty yards ahead"; neuter, third, singular, objective case, the object complement after **made.**

6. What does each of the following modify: **scarce** (1), **mixed** (6), **ninety miles** (8), **an hour** (8), **twenty yards** (9)?

Answer.—Scarce modifies **anything; mixed, flakes; miles** is the object of some preposition understood, in a phrase limiting **moved; ninety** limits **miles; an, hour; hour** is the object of a preposition understood, in a phrase limiting **moved; twenty** limits **yards; yards** is the object of a preposition understood in a phrase limiting **ahead.**

7. Parse in full **anything** (1), **but** (2) and **impossible** (9).

Answer.—Anything is a common noun; neuter, third, singular, nominative case, the subject of **was. But** is a preposition showing relation between **lashing** and **anything. Impossible** is an adjective, descriptive, incomparable; it is used as the objective complement after **made.**

8. What are the principal parts of a verb? Why are they so called?

Answer.—The principal parts of a verb are the present

indicative or infinitive, the past indicative and the past participle. By some the present participle is included. These forms are called "principal parts" because they are the fundamental ones from which other verb expressions are derived.

9. Write sentences illustrating the use of conjunctive adverbs, correlative conjunctions.

Answer.—He came when you called. He is older than you. When and than are conjunctive adverbs. Correlative conjunctions are seen in, "Either you or he must go."

10. Classify (as to part of speech) each of the words in black type in the following: "What but praise can be ascribed to those whose lives were freely given for their country that perpetual freedom might be ours."

Answer.—What is an interrogative pronoun; those, an adjective pronoun; whose, a relative pronoun; their, a personal pronoun; ours, a personal pronoun.

APRIL, 1907.

Describing the storm, he told us that the wind, sprung up since nightfall, roared, with a fury he trembled to behold, round the bleak hilltop whose fir trees bent almost double, and, hissing through every crevice of the shaken cottage, escaped, an angry demon, to spend its rage upon the plain below.

The first six questions refer to the selection given above.

1. What kind of sentence is the above? What is its principal clause? Classify all of its subordinate clauses and tell what word each modifies.

Answer.—The sentence is complex. Principal clause: "Describing the storm, he told us." Noun clause, object of told; "that the wind, sprung up since nightfall, roared, with a fury . . . round the bleak hilltop . . . and, hissing through every crevice of the shaken cottage, escaped, an angry demon, to spend its rage upon the plain below." "He trembled to behold," is an adjective clause limiting fury; the relative is understood. "Whose fir trees bent almost double," is an adjective clause limiting hilltop.

2. Give the syntax of two infinitives. Write all the remaining infinitive forms of each.

Answer.—To **behold** is an adverbial modifier of **trembled; to spend** is an adverbial modifier of **escaped.** Present perfect, to **have beheld; to have spent.** Passive: present, **to be beheld; to be spent;** present perfect, **to have been beheld; to have been spent.**

3. What classes of adverbs are found? Point out the adverbs under each class.

Answer.—**Up,** manner; **almost,** degree.

4. Diagram or analyze that part of the sentence which precedes the word "whose."

Answer.—Principal clause: **he** is the subject; **told,** the incomplete predicate; **us,** the indirect object of **told;** the following noun clause, the direct object; **Describing** is an adjective participle limiting **he,** and takes **storm** as an object; **the** is an adjective modifier of **storm.** The noun clause, used as the object of **told; wind** is the subject; **roared,** the predicate; **wind** is modified by the participle **sprung,** which is modified by the adverbial elements **up** and **since nightfall**—the latter being a prepositional phrase; **roared** is modified by the adverbial prepositional phrases **with fury** and **round hilltop; fury** is limited by **a** and the adjective clause, **he trembled to behold; hilltop** is modified by the adjectives **the** and **bleak; that** is an introductory conjunction: The adjective clause, modifying **fury; he** is the subject, **trembled,** the predicate; **to behold,** is an adverbial modifier of **trembled;** the relative **that,** understood, is the object of **behold,** and joins the clause to **fury,** its antecedent.

5. Find all the different uses of the participle in the selection.

Answer.—**Describing** is a present participle, active, limiting **he; sprung** is a past participle, passive, limiting **wind; hissing** is a present participle, limiting **wind.**

6. Parse **us, that, double, demon.**

Answer.—**Us** is a simple personal pronoun; antecedent, persons speaking; first person, common gender, plural, objective case, the object of **to** understood. **That** is an introductory subordinate conjunction, introducing the noun clause. **Double** is an adjective, descriptive, cannot be compared, is used as an attribute after **bent;** it may be parsed

as an adverb of manner limiting **bent.** Both views are held. **Demon** is a noun, common, masculine gender, third, singular, nominative case, as attribute after **escaped.**

7. Give a complete classification of adjectives, with examples of each class.

Answer.—Adjectives fall first into two main classes, descriptive and definitive; e. g., (a) **cold** and (b) **one.** Definitives may be subdivided into articles, **the, a, an;** pronominals, **that, some,** etc.; numerals, **one, two,** etc. Pronominals may be subdivided into demonstratives, **that, this,** etc.; distributives, **each, every,** etc.; indefinites, **some, any,** etc. Numerals may be subdivided into cardinals, **one, two,** etc.; ordinals, **first, second,** etc.; multiplicatives, **one-fold, two-fold,** etc.

8. Write sentences containing: (a) an adverbial clause of time, (b) a compound participle, (c) a clause subject and predicate, (d) a prepositional phrase used independently.

Answer.—(a) **When he comes,** we shall go. (b) **Having described** the storm, he talked of other things. (c) **What** one should study is not **how** one should study. (d) **For instance,** the human race is divided into several classes. Some writers regard **For instance** as **nearly** independent. Most sentences filling the requirements of (c) must be more or less unidiomatic.

MAY, 1907.

1 Breathes there a man with soul so dead
2 Who never to himself hath said,
3 This is mine own, my native land!
4 Whose heart hath ne'er within him burned,
5 As home his footsteps he hath turned
6 From wandering on a foreign strand!
7 If such there be, go mark him well;
8 For him no minstrel raptures swell.
9 High though his titles, proud his name,
10 Boundless his wealth as wish can claim;
11 Despite those titles, power and pelf,
12 The wretch concentered all in self,
13 Living, shall forfeit fair renown,

14 And, doubly dying, shall go down
15 To the vile dust from whence he sprung,
16 Unwept, unhonored, and unsung.

—Scott.

All of the questions in this list are based upon the selection given above.

1. What words necessary to the analysis of the sentences are understood in lines 4, 9 and 10? What is the omission of these words called?

Answer.—**Are** and **is** in l. 9; **is** in l. 10. Ellipsis.

2. Name (as to unmodified subject and predicate of principal clause) and classify (as to both form and use) each sentence.

Answer.—**Man,** in l. 1, and **Breathes,** in l. 1, are the respective subject and predicate of the principal clause of the first sentence. **You,** understood, is the subject of the principal clause of the second sentence; **go,** the predicate. Of the third, **wretch** is the subject; **shall forfeit** and **shall go** the predicate. The first sentence is complex and exclamatory; the second, compound and imperative and declarative; the third, complex and declarative.

3. Classify all subordinate clauses as adjective, objective or adverbial, and attach each to the word it modifies.

Answer.—**Who never to himself hath said,** adjective modifier of man; **This is my own, my native land,** noun clause, object of said; **Whose heart hath ne'er within him burned,** adjective modifier of man; **As home his footsteps he hath turned,** adverbial modifier of burned; **If such there be,** adverbial modifier of go; **High though his titles (are), proud (is) his name, Boundless (is) his wealth,** adverbial modifiers of **shall forfeit** and **shall go; as wish can claim,** adverbial modifier of (as); **from whence he sprung,** adjective modifier of **dust.**

4. Give all the modifiers of **shall forfeit** (13) and **shall go** (14).

Answer.—**shall forfeit** is modified by the object **renown; shall go,** by **down** and **to the vile dust,** and is completed by the attributes **Unwept, unhonored,** and **unsung;** they are modified by the clauses as mentioned in answer (3).

5. In what mode and tense is each of the following

verbs: **hath said** (2), **be** (7), **can claim** (10), **shall forfeit** (13), **sprung** (15)?

Answer.—Hath said, indic. mode, pres. per. tense; **be,** subj. mode, pres. tense; **shall forfeit,** indic. mode, future tense; **sprung,** indic. mode, past tense.

6. (a) Explain the form of the auxiliary in **hath burned** (4) and in **shall go** (14).

(b) Parse **mark** (7).

Answer.—(a) **Hath** denotes pres. per. tense. This is a solemn and poetic form. **Shall** is the future, third, denoting necessity.

(b) **Mark** is a regular verb; parts, **mark, marked, marked;** transitive, active, imper. mode, second person, singular number, to agree with (you).

7. Point out all participal uses.

Answer.—Wandering, a noun participal; **concentered, living, dying,** adjective participles; **Unwept, unhonored,** and **unsung,** adjective participles as attributes after **shall go.**

8. Select five different adverbs and tell to what class each belongs.

Answer.—So, degree; **never,** time; **well,** manner; **doubly,** degree; **down,** place.

9. (a) Give an example of every class of pronoun found in the selection.

(b) Parse **home** (5) and **as** (10).

Answer.—Who, relative; **himself,** compound personal; **This,** an adjective pronoun; **him,** personal.

(b) **Home** is a noun, common; neuter, third, singular; objective case, the adverbial object after some preposition understood. **As** is a conjunctive adverb of degree, limits **can claim.**

10. What part of speech is each of the following: **there** (1), **this** (3), **ne'er** (4), **as** (5), **such** (7), **minstrel** (8), **though** (9), **despite** (11), **self** (12), **whence** (15).

Answer.—There, an independent adverb, used as an expletive; **this,** adjective pronoun; **ne'er,** adverb; **as,** conj. adverb; **such,** adjective; **minstrel,** adjective; **though,** conjunction; **despite,** preposition; **self,** noun; **whence,** a relative pronoun.

JUNE, 1907.

Remember, then, that readers are a busy people, who would have their stories served in condensed pellets if they could, and that to win their approbation you must begin well along in your tale, where enough complications are to be found to catch the interest. In writing, as nowhere else, can be seen the truth of the trite old proverb, "Well begun is half done."—L. W. Quirk.

The first eight questions refer to the selection given above.

1. Name (as to subject and predicate) and classify (as objective, adjective or adverbial) all subordinate clauses.

Answer.—Of the first sentence, **you** is the subject; **Remember,** the predicate. Of the second sentence, **truth** is the subject; **can be seen,** the predicate. Objective clauses: **that the readers are a busy people; and that to win their approbation you must begin well along in your tale.** Adjective clause: **who would have their stories served in condensed pellets.** Adverbial clauses: **if they could; where enough complications . . . catch the interest; as (it can be seen) nowhere else.**

2. Give all the modifiers of **along** (5); of **can be seen** (7-8).

Answer.—**Along** is modified by **well; can be seen,** by **In writing,** by **as** and the clause it introduces.

3. Mention and give the mood of all finite verbs.

Answer.—**Remember,** imperative; **are,** indicative; **would have,** potential; **could (have),** potential form with subjunctive meaning; **must begin,** potential; **are,** indicative; **can be seen,** potential; **is,** indicative.

4. What part of speech is each of the following: **then** (1), **that** (1), **condensed** (3), **nowhere** (7), **half** (9)?

Answer.—**Then,** independent adverb; **that,** introductory conjunction; **condensed,** adjective; **nowhere,** adverb; **half,** adverb.

5. Point out and give the syntax of all participal forms.

Answer.—**Served** is a past participle, used as an objec-

tive complement belonging to **stories**; **begun**, l. 9, is a noun participle used as the subject of **is**; **done**, a noun participle used as the attribute after **is**.

6. No question asked as No. 6.

7. Attach all infinitives to their modifiers.

Answer.—To **win** modifies **must begin**; **to be found** is an attribute after **are**, and belongs to **complications**; **to catch** limits **to be found**.

8. Parse **could** (3), **well** (5), **as** (7), **else** (7), **well** (9).

Answer.—**Could (have)** is a verb, irregular; parts, **have, had, had**; transitive, active; potential form with a subjunctive meaning; past, third, plural; it agrees with **they**. **Well** is an adverb of degree, limiting **along**. **As** is a conjunctive adverb of manner, limiting **can be seen** understood and the same verb is expressed. **Else** is an adverb of degree, limiting **nowhere**. **Well** is an adverb of manner, limiting **begun**.

9. Show how the following verb forms are made and illustrate each: emphatic, progressive, passive.

Answer.—The emphatic verb is formed by prefixing **do** or **did** as an auxiliary to obtain the present and past tenses, as, **He does study, He did go.** The progressive verb is formed by prefixing some form of the verb **to be** to the present participle of a verb, as, **He is singing.** The passive voice is formed by prefixing some form of the verb **to be** to the past participle of a transitive verb, as, **He is praised.**

10. Give a complete classification of pronouns.

Answer.—Simple personal, compound personal, interrogative, simple relative, compound relative, adjective pronoun. Some writers subdivide the adjective pronouns into demonstratives, distributives, indefinitives and reciprocals.

JULY, 1907.

1 We should justly ridicule a general, who,
2 just before an action, should suddenly disarm
3 his men, and, putting into the hands of all of
4 them a Bible, should order them, thus equip-
5 ped, to march against the enemy. Here we
6 plainly see the folly of calling in the Bible to
7 support the sword; but is it not as great a

folly to call in the sword to support the Bible? Our Savior divided force from reason, and let no man presume to join what God hath put asunder. when we combat error with any other weapon than argument, we err more than those whom we attack.—Colton.

The first eight questions are based upon the selection quoted above.

1. Point out all subordinate clauses (naming only subject and predicate) and classify them (as adjective, objective or adverbial).

Answer.—Adjective clauses: **who,** l. 1, subject, **should disarm** and **should order,** the verbs; **God,** l. 10, subject; **hath put,** the verb; **we,** l. 13, subject; **attack,** verb.

Adverbial clauses: An adverbial clause is really understood in the second member of the second sentence. It would read something like this: **as the above act is;** it expresses degree; **we,** l. 11, subject; **combat,** verb; **argument,** l. 12, subject; **is,** understood, the verb; **those,** l. 13, subject; **err,** l. 13, verb.

2. Give the syntax of four infinitives.

Answer.—Infinitive phrases: **to march,** the object of **should order; to support,** adverbial modifier of **calling; to call,** in apposition with **it; to support,** adverbial modifier of **call.**

3. Explain all participial uses.

Answer.—Participial: **putting,** present par., limits **general; equipped,** past par., limits **them; calling,** noun par., or gerund, object of **of.**

4. Select ten adverbs and tell to what class each belongs.

Answer.—Adverbs: **justly,** manner; **just,** degree; **suddenly,** manner; **thus,** manner; **Here,** place; **plainly,** manner; **in,** place; **not,** modal; **as,** degree; **more,** degree.

5. Give the mood and tense of each of the following verbs: Should ridicule (1), should disarm (2), let (9), presume (10), hath put (10).

Answer.—Mode and tense: **should ridicule,** potential, past; **should disarm,** potential, past; **let,** imperative, present; **presume** is an infinitive, present; **hath put,** indicative, present.

6. Classify each sentence according to (a) use and (b) form.

Answer.—The first, third and last sentences are declarative; the second, interrogative. As to form, the first and last sentences are complex; the second and third, compound.

7. Select one appositive; one verb in the ancient style; one ellipsis; two abstract nouns.

Answer.—One appositive, **to call**; verb in the ancient form, **hath put**; one ellipsis, [you] **let**, l. 9; two abstract nouns, **force** and **reason**, l. 9.

8. Parse in full, equipped (4-5), in (6), than (12).

Answer.—**equipped** is a past par., regular, transitive, passive, an adjective element limiting **them**. **in** is an adverb, limits **calling**. **than** is a subordinate connective, a conjunctive adverb, has no comparison, limits **err** understood.

9. "Who gave you this candy?" asked the boy who had just come up, helping himself to as many pieces as his mouth would accommodate. Classify all of the pronouns in the above sentence.

Answer.—**Who**, interrogative; **you**, simple personal; **who**, relative; **himself**, compound personal; **as** (second one), in this construction, is by some called a relative; **his**, personal. The **as** above may be parsed as a conjunctive adverb of degree.

10. Classify phrases with respect to use and illustrate each class.

Answer.—Phrases with respect to use: adjective, He is a man **of honor**; adverbial, He came **to me**; noun, **To succeed** is his aim.

ARITHMETIC.

Solutions by Supt. W. N. Davis, Oak Hill, O.

AUGUST, 1906.

1. If I sell one-half of an article for as much as three-fourths of it cost me, what per cent. do I gain? Analyze.

Solution.—Half of the article is sold for what three-fourths of it cost; then the whole of the article would bring one and one-half times as much as the article cost. Selling an article for one-half more than it cost is a gain of 50%.

2. A bankrupt owes $4500; his assets are $1200. What sum should a creditor receive whose claim is $360?

Solution.—The whole debt is to the assets as the creditor's claim is to what he should receive, or $4500 : $1200 :: $360 : ($96), the amount to which the creditor is entitled.

3. $360. Alliance, O., June 24, 1892.

Three months after date, for value received, I promise to pay J. F. Morgan, or order, three hundred sixty dollars, with interest at 6%.

The above note was discounted at a bank at 6%, July 15, 1892. What were the proceeds?

Solution.—The amount of $360 for three months at 6% is $365.40. The bank discount of $365.40 for 71 days, the time from July 15 to September 24, is $4.32; $365.40—4.32 = $361.08, the proceeds.

4. Change 1 £ into United States currency; 8424 cu. ft. into cords; 4956 cu. in. into gallons; 8 bu. into cubic inches.

Solution.—1 £ = $4.866; 8424 cu. ft. ÷ 128 = 65.8125 cords; 4956 cu. in. ÷ 231 = 21.454 gal.; 8 bu. × 2150.42 = 17203.36 cu. in.

5. Bought sugar at 2¾% commission and 2½% for guaranteeing payment; the whole cost was $1500. What was the cost of the sugar?

Solution.—Let 100% = cost of sugar.

100% + 2¾% + 2½% = 105¼%.

105¼% = $1500.

1% = $14.2518.

100% = $1425.18, cost of sugar.

6. Reduce 25″ to the decimal of a degree.

Solution.—There are 3600″ in a degree. 25 ÷ 3600 = .006944 degree.

7. Formulate a rule for the reduction of improper fractions.

Answer.—Improper fractions are reduced by dividing the numerator by the denominator.

8. How many yards of carpet ¾ yd. wide will be needed for a room 20 ft. long by 13½ ft. wide, if the strips run lengthwise? If the strips run crosswise?

Solution.—Suppose the strips to run lengthwise. Since they are to be ¾ yd. or 2¼ ft. wide, it will require exactly six (13½ ÷ 2¼ = 6) strips each 20 ft. in length, which would make 120 ft.. or 40 yd. in all. If the strips run crosswise, it will require the purchase of nine (20 ÷ 2¼ = 8 8-9) strips each 13½ ft. long, which would make 121½ ft. lengthwise, as there is no waste in cutting, provided there is no loss in matching.

9. If a field is in the form of an equalateral triangle whose altitude is 4 rods, what is the cost of fencing in the field at 75 cents a rod?

Solution.—Assume the sides of the equalateral triangle to be 1. Then the altitude is $\sqrt{[1^2-(\frac{1}{2})^2]}=\sqrt{\frac{3}{4}}=\frac{1}{2}\sqrt{3}=.866$. Now the altitude of the assumed triangle : its side :: the altitude of the real triangle : its side, or .866 : 1 :: 4 : (4.62 rd.), the side of the triangle. 4.62 rd. × 3 = 13.86 rd., perimeter. 13.86 rd. × .75 = $10.39, cost of fencing.

10. A and B run a mile in opposite directions: A's running is to B's as 6½ to 5½; B gets four seconds the start, during which time he runs 12 1-10 yards. Find when will he pass A.

Solution.—Their rates are as 13 to 11, and B will run 11/24 of the whole distance run by both, after A starts, which is 1760 yd. — 12 1/10 yd. = 1747 9/10; 11/24 of 1747 9/10 yd. = 801 29/240 yd. Dividing this by A's rate, 3 1/40 yd. per sec., we we get 264 5/6 seconds after A starts.

SEPTEMBER, 1906.

1. What is the reciprocal of a fraction? Illustrate. Multiply the reciprocal of ⅔ by the reciprocal of 5.

Answer.—The reciprocal of a fraction is one divided by the fraction, which is simply the fraction inverted; as the reciprocal of 3/7 is 7/3.

The reciprocal of ⅔ is 3/2 and of 5 is ⅕. $3/2 \times ⅕ = 3/10$.

2. What is the ratio of a pound avoirdupois to a pound troy? What is the inverse ratio of a long ton to a short ton?

Answer.—A pound avoirdupois contains 7000 grains, and a pound troy 5670 grains. The ratio is therefore 7000 to 5760 or 175:144.

The inverse ratio of a long ton to a short ton is 2000:2240 or 25:28.

3. Take two cubes, each measuring 8 inches on a side; from one cut a cylinder; from the other a sphere. Find the cubic contents of each.

Solution.—The altitude and diameter of the cylinder and the diameter of the sphere will each be the same as the sides of the cube, which are 8 inches. ∴ volume of cylinder $= .7854 \times 8 = 402.1248$ cu. in. and volume of sphere $= 8^3 \times .5236 = 268.0832$ cu. in.

4. Find the cost at $16 per M of 1½″ lumber for a board walk 5′ wide, which encloses a rectangular grass plot 60′ by 30′.

Solution.—The grass plot is 60 by 30 feet and contains 1800 sq. ft. Including the walk it would be 70 by 40 ft. and contain 2800 sq. ft. The area of the walk is, therefore, $2800 - 1800 = 1000$ sq. ft. $1000 \times 1½ = 1500$ board feet $= 1½$ thousand. $1½ \times \$16 = \$24$.

5. The merchant from whom the lumber for the walk in the previous question was purchased paid but $14.80 per M., What was his per cent of gain on the sale?

Solution.—$\$16 - \$14.80 = \$1.20$ gain per M. By case II of percentage the gain, $1.20, is found to be 8 4/37% of the cost, which is $14.80.

6. An agent charged 2¾% commission and $48 traveling expenses for selling grain; for what sum was the grain sold, if he sent his principal $1,560.20.

Solution.—Let 100% = selling price of grain. 100% — 2¾% — $48 = $1560.20. 97¼% = $1608.20. 1% = $16.53676. 100% = $1653.676, S. P. of grain.

7. If it requires 800 reams of paper to publish 500 volumes of a duodecimo book containing 320 pages, how many reams will be needed to publish 24,000 copies of a book, octavo size, of 550 pages?

Solution.—By proportion

$$\left.\begin{matrix}5000:24000\\320:550\\8:12\end{matrix}\right\} ::800:(9900 \text{ reams})$$

8. For what sum must a two months' note be drawn to yield $1000, when discounted at 6% annum?

Solution.—Bank discount of $1 for 2 months at 6% = .01. $1 — .01 = .99 proceeds. $1000 ÷ .99 = $1010.101, face of note.

9. Find a mean proportional between 25/64 and 100/144.

Solution.—Stating in the form of a proposition, 25/64 : ( ) : : ( ) :100/144. The mean proportional between the two quantities is the square root of their product. ∴ 25/64 × 100/144 = 25/48, the mean proportional.

10. Find the amount due this day on a note given in Cleveland, January 10, 1905, for $500, with interest at 6%, a payment of $45 having been made September 6, 1905.

Solution.—The time from January 10 to September 6, 1905, is 7 mo., 26 days and from Sept. 6, 1905, to Sept. 1, 1906, is 11 mo., 25 days. Amount of $500 for 7 mo., 26 days at 6% is $519.67. Subtracting the payment of $45, we have $474.67. Amount of $474.67 for 11 mo., 25 days is $502.75, the amount due Sept. 1, 1906, as required.

OCTOBER, 1906.

1. Find the L. C. M. of 31° 2′ 10″, 59′ 15″, 80° 11″, 47° 35′ 20″ and 15° 3′ 56″.

Answer.—This problem admits of no solution according to the true definition of a multiple. Multiples of angles can not be formed indefinitely. 180° is the limit of an angle. A multiple of any two of the given numbers would exceed 180° many times. Hence, the problem is impossible.

2. Write and solve a problem which illustrates the following formula in percentage: B = D ÷ (1—r).

Problem—Sold a horse for $60, losing 20%; find cost.

Solution.—Let 100% = cost of horse.

100% — 20% = 80%.

80% = $60.

1% = .75.

100% = $75, cost.

3. Three persons gain $2640 in a speculation, with the understanding that A is to receive $6 as often as B receives $4 and C $2. What is each man's share?

Solution.—Dividing $2640 in the ratio of 6, 4 and 2, we get $1320 for A's share, $880 for B's and $440 for C's.

4. An investor has $21,630 to invest in cotton; he must allow 2½% commission, pay 1½% for marine insurance and 1¾% for cartage and freight; how many pounds of cotton can he buy at 15c. per pound?

Solution.—Let 100% = cost of cotton.

100% + 2½% + 1½% + 1¾% = 105¾%.

105¾% = $21,630.

1% = $204,539.

100% = $20453.90 invested in cotton.

$20453.90 ÷ .15 = 136359 pounds.

5. What would you expect to be mastered by a class having time for only half a dozen recitations on mensuration?

Answer.—In six recitations the class should be able to define and construct many of the more common figures of mensuration, such as the square, rectangle, and trapezoid; right angled, equilateral and isosceles triangle; cube, pyramid, cone, prism and cylinder; radius, diameter, arc and circumference of a circle including the ratio of the circumference to the diameter. After these figures are thoroughly mastered, the rest of the time should be spent constructing and solving elementary problems involving these figures.

6. A pile of wood 63 ft. long, 4 ft. wide and 8 ft. high was sold at $4.75 per cord. For how much was it sold?

Solution.—63 × 4 × 8 = 2016 cu. ft.

2016 ÷ 128 = 15¾ cords.

15¾ × $4.75 = $74.81¼ S. P. of wood.

7. A man purchased real estate and agreed to pay ⅓ of the price in 3 months, ¼ in 8 months, and the remainder in one year. Wishing to cancel the whole obligation by a single payment, how long may this payment be deferred?

Solution.—Paying ⅓ in 3 months is equivalent to paying all in 1 month.

Paying ¼ in 8 months is equivalent to paying all in 2 months.

Paying 5-12 in 12 months is equivalent to paying all in 5 months.

1 + 2 + 5 = 8 months' time when single payment should be made.

8. How many bushels of grain will there be in a heap having the form of a perfect cone whose base is 8 ft. in diameter, and whose altitude is 4 ft.?

Solution.—Radius of base and altitude are each 48 inches. $48^2 \times \pi \times 48 \times ⅓ \div 2150.42 = 53.85$ bushels.

9. If stock bought at 105 will pay 6% on the investment, what per cent will it pay if bought at 85?

Solution.—The rate of divdend is 6% of 105 or 6.3%, and if the stock was bought for 85 the rate of income would be 6.3 of 100/85 = 7 7/71%.

10. At 40 cents a roll, what will be the cost of papering the walls and ceiling of a room 16 ft. long, 12 ft. wide and 10½ ft. high, making no allowance for openings, the base-board being 9 inches high?

Solution.—A roll of paper is 8 yards in length and 18 inches wide.

The walls of the room form a rectangle 56 ft. by 9¾ ft. If the strips are placed up and down it will require thirty-eight (56 ÷ 1½ = 37⅓) strips to paper the walls.

38 × 9¾ = 370½ ft. of paper for walls.

370½ ft. will require 16 rolls, but there will be 14½ ft. over. Supposing the strips of the ceiling to run lengthwise, it will require 8 strips each 16 ft. long or 128 ft. of paper. Five rolls in addition to the 14 ft. left from the walls will be necessary, making a total of 21 rolls, which at 40c. per roll would amount to $8.40.

NOVEMBER, 1906.

1. In a school 77 pupils are present, which is 87½% of the number enrolled. What is the per cent on the enrollment when 60 pupils are present?

Solution.—Let 100% = number enrolled; 87½% = 77; 1% = .88; 100% = 88, number of pupils enrolled. If 88 pupils = 100% 1 pupil = 100/88% and 60 pupils = 68 2/11%.

2. How would you show to a class that annexing ciphers to a decimal does not alter its value?

Solution.—By changing to common fractions and reducing to their lowest terms it may readily be seen that the result will be the same regardless of the number of ciphers annexed.

3. Three men contract to draw 4815 cords of wood for 50 cents a cord. If one furnished 3 teams, another 4 and the third 5, how much did each team earn per day, if the hauling of the wood took 36 days?

Solution.—If 12 teams in 36 days draw 4815 cords, then 12 teams in 1 day draw 133¾ cords, and 1 team in 1 day draws 11.145 cords, which at 50c. per cord amounts to $5.57.

4. If 64 quarts of water are put into a vessel that is made to hold 64 quarts of wheat, how much will the vessel lack of being full?

Solution.—64 qts. = 16 gal. A gallon of wheat contains 268.8 cu. in. and of water 231 cu. in. (268.8 — 231) × 16 = 604.8 cu. in., space left.

5. A dealer brought flour for $900 cash, and sold it immediately for $1080 on six months' credit, for which he received a note. If he should get the note discounted at a bank at 6%, what would he gain on the flour?

Solution.—Bank discount of $1080 for 6 months at 6% is $32.40. $1080 — $32.40 = $1047.60, proceeds of note. $1047.60 — $900 = $147.60 gain.

6. What is the net amount of a bill of $360, 12½% and 8% off? Find a single discount equivalent to the two successive discounts.

Solution.—Let 100% = list price.

12½% of 100% = 12% first discount.

100% — 12½% = 87½%.

8% of 87½% = 7% second discount.
87½% — 7% = 80½% of net price in per cent.
80½% of $360 = $289.80 net price.
A single discount equivalent to the two discounts is 100% —80½% = 19½%.

7. What is a denominate number? A denominate fraction? What is meant by the ascending reduction of denominate numbers?

Solution.—A denominate number is a number having a specific name or denomination; as, 6 feet. A denominate fraction is a fractional denominate number; as, ½ gallon. By ascending reduction of denominate numbers is meant reduction from a lower to a higher denomination, as from feet to miles.

8. The pendulum of one clock makes 25 beats in 28 seconds, and that of another clock 30 beats in 34 seconds. If the clocks are started at the same moment, in how many seconds will they tick together again?

Solution.—The first clock makes one beat in 28/25 seconds and the second makes one beat in 34/30 seconds. The time until the clocks tick together again is the least common multiple of 28/25 and 34/30, which is 95⅕ seconds or 1 minute and 35⅕ seconds.

9. If it costs $80 to plough a field 40 rods by 80 rods when $5 a day is paid for a man and team, how much will it cost to plough a field 30 rods by 60 rods if $4 a day is paid for the man and team? Solve by proportion.

Solution.—
40 rd:30 rd
80 rd:60 rd } ::$80:($36)
$5 :: $4

10. Solve 9 by analysis.

Solution.—The first field contains 3200 sq. rds. and the second 1800 sq. rds.

To plow 3200 sq. rds. with $5 man and team cost $80; to plow 1 sq. rd. with $5 man and team cost .025; to plow 1 sq. rd. with $4 man and team cost .02; to plow 1800 sq. rds. with $4 man and team cost $36.

DECEMBER, 1906.

Solutions by Prof. E. M. Mills, M. Ph., State Normal College of Ohio University, Athens, O.

1. Divide 9.9976 by .042 and prove your work by multiplication.

Solution.—9.9976 ÷ .042 = 238.038 2/21. 238.038 2/21 × .042 = 9.9976.

2. Find the least common multiple of 8.5, 19½, and ¾.

Solution.—8.5 = 17/2. 19½ = 39/2. ¾ = ¾. The L. C. M. of 17, 39, and 3 = 663. The G. C. D. of 2, 2, and 4 = 2. Hence, 663 ÷ 2, = 331½, least common multiple as required.

3. Define simple, compound and partitive proportion. Illustrate each.

Solution.—See any standard text-book.

4. Extract the cube root of .0000001.

Solution.—$\sqrt[3]{.0000001} = .001$.

5. Complete the following rule and write and solve a problem that illustrates it: The areas of similar surfaces are to each other as.....

Solution.—The areas of similar surfaces are to each other as the squares of their like dimensions.

The area of a triangle whose base is 10 ft. is 30 square feet. Find the area of a similar triangle whose base is 15 ft.

$$30:\text{area}::10^2:15^2.\ \therefore\text{area}=\frac{30\times15^2}{10^2}=67\tfrac{1}{2}\text{ sq. feet.}$$

6. I offered cattle for sale at 25% above cost, but was obliged to drop to 14%, thereby gaining $170. What did the cattle cost? What did I offer them for? What did I sell them for?

Solution.—Let 100%=cost of cattle, then,

125%=asking price, and

114%=selling price, and

114%—110%=14%, the profit, then,

14%=$170.

1%=$12.14 2-7.

100%=$1214.28, the cost of the cattle.

114%=$1384.28, the selling price, and

125%=$1517.85, the asking price.

7. Find the interest and amount of $8000 for 2 years at 4½%, interest payable annually.

Solution.—The simple interest of $8000 for 2 years at 4½% = $720. The first years' interest, $360, will draw simple interest for 1 year at 4½%. Then, 4½% of $360 = $16.20, additional interest. ∴ $8000 + $720 + $16.20 = $8736.20, the amount as required.

8. Distinguish between a compound and a denominate number; between interest and discount.

Answer.—See any standard text-book.

9. A cylindrical vessel is 6 feet in diameter; how deep must it be to contain 100 bbl. of water?

Solution.—31½ × 100 × 231 cu. in = 727650 cu. in., contents of the cistern. 6 ft. = 72 inches, diameter of cistern. Then, $(36)^2 \times 3.1416 = 4071.5136$ sq. in., area of bottom of cistern. Hence, 727650 ÷ 4071.5136 = 178.7 inches, depth of the cistern as required.

10. Find the prime factors of 1226, 1938 and 2346. Indicate which of these must be combined to produce the greatest common divisor of the numbers; the least common multiple of the numbers.

Solution.—
1226=2×613
1938=2×3×17×19
2346=2×3×17×23.
∴ G. C. D. =2, and
L. C. M.=2×3×17×19×23×613=27182272.

JANUARY, 1907.

1. Explain the principle of partitive proportion.

Answer.—Partitive proportion is the process of separating a number into parts which bear certain relations to each other. For an explanation of the principle of partitive proportion, and its application to the solution of problems, see Mills's Arithmetical Analysis.

2. Write: A compound denominate number; a continued fraction; a compound ratio.

Solution.—(1) 3 bu., 3 pk., 2 qt. and 1 pt.

$$\cfrac{1}{\quad}$$

$$(2)\quad 2+\cfrac{1}{1+\frac{1}{2}}$$

(3) $\left\{\begin{matrix}3:5\\5:6\end{matrix}\right\}$

3. Paris is 2° 20′ 22″ east from Greenwich; will a traveler's watch be slow or fast, and how much, when he has traveled from the latter to the former place?

Answer.—2° 20′ 22″ corresponds to 9 minutes and 21 7/15 seconds of time. Then since the traveler goes eastward his watch becomes **slow** by exactly 9 min. 21 7/15 seconds.

4. Reduce to units of higher denominations: (a) 47384d, (b) 4567 gr. Apoth.

Solution.—47384d. = 197 £, 8s, 8d.

5. Explain a method of finding the greatest common divisor of two fractions.

Answer.—See any higher arithmetic for full explanation.

6. When will the hands of a clock be at right angles between 11 and 12 o'clock?

Solution.—At 11 o'clock the hour hand is at 11 and the minute hand at 12. The hands of a clock are at right angles to each other, on a 12 hour dial, when they are 15 minute spaces apart. Hence, if the hour hand were to stand still until the minute hand would move forward 10 minute spaces the hands would be at right angles for the **first** time. Since the hour hand will not stand still, let 1% = distance it moves while coming into the required position. Then 10 minutes + 1% = distance the minute hand must move in the same time. The minute hand moves 12 times as fast as the hour hand.

∴12% = 10 min. + 1%.

11% = 10 min.,

1% = 10/11 of a minute. Hence,

10 min. + 1% = 10 10/11 minutes.

∴10 10/11 min. past 11 o'clock will be the first time after 11 at which the hands will be at right angles to each other.

Again, if the hour hand were to stand still till the minute

hand would move forward to 8 on the dial, the hands would be 15 minute spaces apart and consequently at right angles with each other. Thus as before, since the hour hand does not stand still, let 1%=distance it moves while coming into this second position, and 40 minutes+1%=distance the minute hand must move in the same time. Then, as before, we have,

12%=40 min.+1%;

11%=40 min.,

1%=3 7/11 minutes, and

40 min.+1%=43 7/11 minutes.

∴ 43 7/11 minutes past 11 o'clock is the second time between 11 and 12 o'clock at which the hands will be at right angles to one another.

7. For what sum must a note for 2 mo. 17 da. be made so that the proceeds after it has been discounted at a bank at 7% may be $895?

Solution.—The bank discount on $1 for 2 mo. 17 days at 7%=$.014 35/36. ∴$1—$.014 35/36=$.985 1/36, proceeds of $1 of the note. Then, $895÷$.985 1/36=908.63+; ∴$908.63 =sum for which note must be given as required in the problem.

8. Simplify:

$$\frac{(.00056542)^2}{(12.534)^2}.$$

Solution.—

$$\frac{(.00056542)^2}{(12.534)^2}=\frac{.00056542\times.00056542}{12.534\times12.534}=.00000000203+.$$

FEBRUARY, 1907.

1. Find the L. C. M. of $2\frac{3}{4}$, 3, $\sqrt[3]{(8/27)}$, and .05.

Solution.—$2\frac{3}{4}=11/4$; $\sqrt[3]{(8/27)}=\frac{2}{3}$; and .05=1/20. The L. C. M. of 11/4, 3/1, $\frac{2}{3}$, and 1/20 is 66, for the L. C. M. of the numerators of these fractions is 66, and the G. C. D. of their denominators is 1.

2. A man bought a horse for $150. How much must he ask for the horse so that he can fall $12\frac{1}{2}\%$ and still make 20% profit?

Solution.—Let 100% = asking price of the horse. 12% = reduction from asking price. Then, 100% — 12½% = 87½%, the selling price. $150 = cost of horse, and 20% = actual rate of profit on this cost. 20% of $150 = $30, amount of profit realized by the sale. $150 + $30 = $180, the selling price. ∴ 87½% = $180. 1% = $72-35, and 100% = $205 5-7, the asking price.

3. A cubic foot of water weighs about 62 lbs. 8 oz. At that rate, how much does a barrel of water weigh?

Solution.—(231/1728)×31½×62½ lbs.=263 47/256 lbs.

4. If stock bought at 20% premium pays 5% on the investment, what would it pay if bought at 20% discount?

Solution.—A 100-dollar certificate of this stock bought at 20% premium would cost $120, and would yield 5% of $120 =$6. When a 100-dollar certificate of stock earns a dividend of $6, it is 6% stock. If this certificate of stock is bought at 20% discount, it will cost $80, and still earn $6. The question now is, what per cent of $80 is $6? This is readily found to be 7½%.

5. Find the side of a square that would be equal in area to a trapezoid whose parallel sides are 16 ft. 8 in. and 20 ft. 4 in., and whose altitude is 8 ft.

Solution.—8-2 ($16\frac{2}{3} + 20\frac{1}{3}$) = 148, area of trapezoid in square feet. Then, $\sqrt{148} = 12.165+$, side of square in feet.

6. When it is Monday, 7 a. m., at San Francisco, longitude 122° 24′ 15″ W., what day and time of day is it at Berlin, longitude 13° 23′ 55″ E.?

Solution.—122° 24′ 15″ + 13° 23′ 55″ = 135° 48′ 10″, difference of longitude between the two cities. 135° 48′ 10″ corresponds to 9 hours 3 minutes, and $12\frac{2}{3}$ seconds of time. Hence, San Francisco has its 7 a. m., 9 hours 3 min. $12\frac{2}{3}$ seconds later than Berlin. Therefore, when it is 7 a. m. at San Francisco, it is 4 o'clock 3 min. and $12\frac{2}{3}$ seconds p. m. of Monday at Berlin.

7. A consignee sells $6,742 worth of woolen goods, charging 2½% commission and 1¾% for insuring payment. What sum will he pay over to the consignor?

Solution.—2½c + 1¾c = 4¼c, agent's commission and allowance on $1 of the sales. Hence, 6742 × 4¼c = $286.535, agent's total commission and allowance. Then, $6742 — $286.535 = $6455.465, proceeds as required.

8. If 468 bricks, 8 inches long and 4 inches wide, are required for a walk 26 feet long and 4 feet wide, how many bricks 6 inches long and 4½ inches wide, will be required for a walk 120 feet long and 5 feet wide?

Solution.—468 | (×) :: 26 | 120
8 | 6 4 | 5
4 | 4½ |

$$\therefore \frac{468\times8\times4\times120\times5}{26\times4\times6\times4\frac{1}{2}} = 3200,$$ the number of bricks as required.

9. Define prime number; repetend; circulating decimal

Solution.—See any good text-book.

10. On a note dated Aug. 15, 1885, for $3500, were the following indorsements: Oct. 10, 1885, $320; Feb. 5, 1886, $476; April 20, 1886, $525; June 24, 1886, $700. What amount was due Aug. 3, 1886, at 7%?

Solution.—The amount of $3500 from Aug. 15, 1885, to Oct. 10, 1885, at 7%=$3537.43. Then, $3537.43—$320=$3217.43, new principal. The amount of $3214.43 from Oct. 10, 1885, to Feb. 5, 1886, at 7%=$3289.375. Then, $3289.375—$1476=$2813.375, new principal. The amount of $2813.375 from Feb. 5, 1886, to April 20, 1886, at 7%=$2854.403. Then, $2854.403—$525=$2329.403, new principal. The amount of $2329.403 from April 20, 1886, to June 24, 1886, at 7%=$2358.391. Then, $2358.391—$700=$1658.391, new principal. The amount of $1658.391 from June 24, 1886, to Aug. 3, 1886, at 7%=$1670.967. ∴ $1670.967=amount due as required.

MARCH, 1907.

1. Define the following: Decimal fraction, below par, Arabic notation, compound denominate number, cancellation.

Answer.—See any good text-book.

2. How many feet board measure are there in a plank 17 ft. long, 22 in. wide at one end, 13 in. wide at the other, and 3 in. thick?

Solution.—

$$\frac{(13+22)\times17\times12\times3}{2\times144} = 74\frac{3}{8},$$ number of feet board measure.

3. A commission merchant sold a consignment of flour

and pork for $25,372; he charged $132 for storage and 6¾% commission. What were the net proceeds of the sale?

Solution.—6¾% of $25372 = $1712.61, commission.

$1712.61 + $132 = $1844.61, commission and storage.

Then, $25372 — $1844.61 = $23527.39, net proceeds of sale.

4. A druggist bought 5 pounds of opium by avoirdupois weight at $8 a pound, and sold it by apothecaries' weight at $1 per ounce. How much did he gain?

Solution.—5 × $8 = $40, cost of the opium.

5 × 7000 gr. = 35000 gr., amount of opium purchased.

1/12 of 5760 = 480, number of grains in an apothecary ounce.

∴ 35000 ÷ 480 = 72 11/12, number of apothecary ounces sold. Hence,

72 11/12 × $1 = $72 11/12, selling price of the opium.

$72 11/12 — $40 = $32 11/12, amount of gain by the sale.

5. An army lost in one battle 2/17 of its men, and in another battle 2/7 of the remainder, after which there were 15,150 men left. How manymen were in the original army? Analyze.

Solution.—17/17 — 2/17 = 15/17, number of men left after first battle.

2/7 of 15/17 = 30/119, number of men left after second battle.

15/17 — 30/119 = 75/119, number of men left after second battle.

∴ 75/119 = 15150.

1/119 = 1/75 of 15150 = 202, and

119/119 = 119 × 202 = 24038, number of men in original army.

6. A man engaged in business, with a capital of $22,800, is making 10% per annum on his capital; but on account of ill health, he quits his business, and loans his money at 6½%. How much does he lose in 2 yr. 5 mo. 10 da.?

Solution.—10% — 6½% = 3½%, difference in rates of profit.

3½% of $22800 for 2 yr. 5 mos. 10 days = $1952.66⅔, annual loss as required.

7. At what time between four and five o'clock are the hands of a clock together?

Solution.—At 4 o'clock the minute hand is at 12 and the hour hand at 4. If the hour hand stood still till minute hand should move 20 minutes, the hands would be together. But since it does not stand still, let 1% = distance the hour hand moves while the hands are coming into the required position, and 20 minutes + 1% will be the distance the minute hand will move in the same time. Then, since the minute hand moves 12 times as fast as the hour hand, we have,

12% = 20 min. + 1%.
11% = 20 minutes,
1% = 1 9-10 minutes, and
20 min. + 1% = 29 9-11 minutes. Hence,
21 9-11 minutes past 4 is the required time.

8. If a cistern 17½ feet long, 10½ feet wide, and 13 feet deep holds 546 barrels, how many barrels will a cistern hold that is 16 feet long, 7 feet wide, and 15 feet deep?

Solution.—By "Cause and Effect" we have the following solution:

17½ | 16 :: 546 | (?)
10½ | 7 |
13 | 15 |

$$\frac{16\times7\times15\times546}{17\frac{1}{2}\times10\frac{1}{2}\times13} = 384, \text{ number of barrels as required.}$$

9. A man paid $10,989 for 6% railway stock at 110⅞, brokerage ⅛%; how many shares did he buy? What was his annual income from the stock?

Solution.—$10989 = cost of stock.

$1.10⅞ + ⅛c = $1.11, cost of $1 of the stock.

∴ $10989 ÷ $1.11 = 9900; ∴ $9900 = par value of the stock.

6% of $9900 = $594, annual income from the stock.

If the par value of one share is $100, there were 99 shares of stock.

10. Find the greatest common divisor of 1 8-13, 1 7-15, 1 3-20.

Solution.—1 8-13 = 21-13.
1 7-15 = 22-15.
1 3-20 = 23-20.

The G. C. D. of 21, 22, and 23 is 1.
The L. C. M. of 13, 15, and 20 is 780.
∴ G. C. D. of 21-13, 22-15, and 23-20 is 1-780.

APRIL, 1907.

1. A speculator bought 50 shares of stock at 80, and sold them at 88. How much did he gain, brokerage in each case being ⅛%?

Solution.—.80 + .00⅛ = .80⅛; .80⅛ × 100 = $80⅛, the cost of a hundred-dollar share through an agent. 88 — .00⅛ = .87⅞; .87⅞ × 100 = $87⅞, the net selling price of a hundred-dollar share through an agent.

∴ $87⅞ — $80⅛ = $7¾, gain on one share.

50 × $7¾ = $397.50, gain on fifty shares.

2. If a horse tied to a stake by a rope 7.13 rods in length can graze upon just one acre of ground, how long should the rope be to enable him to graze upon 6½ acres?

Solution.—The dimensions of similar surfaces are to each other as the square roots of their areas.

∴ $\sqrt{160} : \sqrt{1040} :: 7.13 : x$.

Hence, $x = 18.18$ rods.

3. I bought land at $30 an acre. How much, per acre, must I ask for it, that I may fall 25% from my asking price, and still make 20% on the purchase money?

Solution.—20% of $30 = $6, the gain.

$30 + $6 = $36, selling price.

25% = ¼; 4/4 is asking price.

4/4 — ¼ = ¾, selling price.

∴ ¾ = $36.

¼ = $12.

4/4 = $48, asking price.

4. What is the fractional difference between 1/680 of a hhd. and ⅗ of a pint?

Solution.—1 hhd. = 63 gallons, or 504 pts.

1/680 of 504 = 63/85 pt. ⅗ = 51/85 pt.

∴ 63/85 — 51/35 = 12/85, difference as required.

5. On a bill of goods amounting to $500, what is the difference between a discount of 30% and three successive discounts of 15%, 10% and 5%?

Solution.—30% of $500 = $150, first discount.

$500 × .85 × .90 × .95 = $363.375.

$500 — $363.375 = $136.625, second discount.

$150 — $136.625 = $13.375, the difference.

6. In a class examination, 165 questions were submitted to each of the 5 members; A answered 130, B 125, C 96, D 110, and E 160. What was the standing of the class?

Solution.—

$$\frac{130+125+96+110+160}{5} = 124.2,$$ average number of questions answered.

$$\frac{124.2}{165} = 75\ 3/11\%,$$ standing of class.

7. Divide $1596 into parts proportional to ⅔, ¾, ⅘.

Solution.—⅔, ¾, ⅘ are equal respectively to 40/60, 45/60, 48/60. Now we may divide the number in proportion to the numerator,

40 + 45 + 48 = 133. 40/133 of $1596 = $480;

45/133 of $1596 = $540; 48/133 of $1596 = $576.

8. A note of $1000, dated April 4, 1905, was indorsed as follows: June 1, 1905, $90; May 5, 1906, $350. How much is due today, interest at 6%?

Solution.—The interest on $1000 from April 4, 1905, to June 1, 1905, is $9.50; $1000 + $9.50 = $1009.50 due June 1.

$1009.50 — $90 = $919.50, amount unpaid June 1.

Interest on $919.50 from June 1 to May 6, 1906, is $51.338; 919.50 + 51.338 = $970.838, due May 5.

$970.838 — $350 = $620.838, amount paid May 5.

Interest from May 5 to April 6, 1907, is $34.186; $620.282 + $34.186 = $655.024, due April 6, 1907.

9. Do you believe it better for pupils to use an arithmetic with answers or without? Why?

Note.—Answers of good teachers vary.

10. Give the units of length, surface and capacity of the metric system.

Note.—See any standard arithmetic.

MAY, 1907.

1. The battle of Manila (121°20′E.) began at 5.41 a. m., Sunday, May 1. What was the time at Washington (77°3′ W.) when the battle began?

Solution.—121° 20′ E.=longitude of Manila.

77° 3′ W.=longitude of Washington.

∴ 198° 23′=difference of longitude between the two cities when measured on the equator from the meridian of Manila through the meridian of Greenwich to the meridian of Washington. Hence—

360°—198° 23′=161° 37′, difference of longitude when measured directly on the equator from the meridian of Manila to the meridian of Washington. But 161° 37′ corresponds to 10 hours 46 min. 28 sec. of time. Then when it was 41 minutes past 5 o'clock a. m. Sunday at Manila, it was 10 hours 46 min. 28 sec. **after** that hour **Saturday** at Washington. But 10 hours 46 min. 28 sec. after 5:41 a. m. Saturday would give 27 minutes and 28 seconds past 4 o'clock p. m. Saturday.

Note.—The International Date Line is between Manila and Washington when the difference of longitude is measured on the equator **directly** from the meridian of Manila to the meridian of Washington. This fact must be taken into account in the solution of all such problems.

2. If I exchange 48 shares of a 9% stock at 176 for U. S. 4's at 116½, how much must I add to my investment to secure the same income?

Solution.—48×$100=$4800, par value of 9% stock if the par value of a share is $100.

9% of $4800 = $432, annual income on 9% stock.

4800×$1.76=$8488, cash value of 9% stock.

$432÷$.04=10800; ∴ $10800=par value of U. S. 4's that would yield an income of $432 annually.

10800×$1.165=$12582, cash value of the U. S. 4's. Hence $12582—$8448=$4134, amount that must be added to secure the same income.

3. What is the difference between the true and the bank discount of $360, due 6 months hence, at 6%?

Solution.—The bank discount on $360 for 6 months at 6%=$10.80.

$360 ÷ 1.03 = 349.51; ∴ $349.51 = present worth by true discount. Then,

$360—$349.51=$10.49, true discount.

$10.80—$10.49=$.31, the difference as required.

4. Find the cost of flooring for a building 25 by 70 feet, the building being 3 stories high and the flooring 1½ inches thick, at $19.10 per M.

Solution.—$\frac{3\times25\times70\times1\frac{1}{2}}{1000}\times\$19.10=\$150.4125.$

5. A rectangular field containing 8 acres is 32 rods wide. How much will it cost to construct a ditch from one corner to the diagonally opposite corner at $3 a rod?

Solution.—8 acres=1280 square rods. Then
1280÷32=40, the length of the field in rods.
$\sqrt{(40^2+32^2)}=51.22+$, length of ditch in rods.
51.22×$3=153.66, cost of ditch as required.

6. Define notation; numeration; mensuration.

Answer.—See any good arithmetic.

7. If the interest on $450 for 2 years 4 months is $52.50, what will be the interest on $200 for 4 years 4 months 20 days at the same rate?

Solution.—The interest on $450 for 2 years 4 months at 1%=$10.50. Then,
$52.10÷$10.50=5; ∴ 5%=rate of interest.
The interest on $200 for 4 years 4 months 20 days at 5%=$43.89 $^{8}/_{9}$.

8. Mr. Hallam deposited 80% of his money in a bank, and afterward drew out 20% of the sum deposited and then had $3859 in the bank. What was the amount of his money?

Solution.—Let 100%=his money.
85%=amount deposited in bank.
20% of 85%=17%, amount withdrawn from bank.
85%—17%=68%, amount remaining in bank. Then,
68%=$3859.
1%=$56.75, and
100%=$5675, his money as required.

9. At what rate will $712 earn $142.40 in 3 years 4 months?

Solution.—The interest on $712 for 3 years 4 months at 1%=$23.73⅓. Then,
$142.40÷$23.73⅓=6; ∴ 6%=rate of interest as required.

10. Find the area of a right triangle, base 23.1 ft., altitude 32.1 ft.

Solution.—

$$\text{Area triangle} = \frac{23.1 \times 32.1}{2} \text{ or } 370.755 \text{ sq. ft.}$$

JUNE, 1907.

1. The L. C. M. of several numbers is 8190, and their G. C. D. is 7; what are the numbers?

Solution.—5, 2, 3, 3, 91 are the prime factors of 8190. Therefore the required numbers are: $5 \times 7 \times 2 = 70$; $3 \times 7 = 21$; $5 \times 3 \times 2 = 30$; 91; 7.

2. Write a compound denominate number; a compound proportion; a promissory note.

Note.—See any standard arithmetic.

3. A man invests $4500 in Pullman car stock at 156, brokerage ⅛, and receives semi-annual dividends of 3½%. Find the annual rate of income on his investment.

Solution.—$1.56 + .00⅛ = $1.56⅛, cost of one dollar's worth of stock. $4500 ÷ 1.56⅛ = $2882.306, number dollars' worth he could buy for $4500. $2882.306 × 3½% = $100.88; 100.88 × 2 = $201.76, annual income.

$$\frac{201.76}{4500} = 4.48\%, \text{ anual rate of income on the investment.}$$

4. Indicate a short method of multiplying by 10; by 25; by 33⅓; by 9.

Answer.—(a) Add a cipher; (b) add two ciphers, divide by 4; (c) add two ciphers, divide by 3; add a cipher and subtract the number.

5. On March 30 a coal dealer borrowed $19,000 at 5%, with which he purchased his summer's supply of coal at $4.75 a ton. He sold the coal for $5.60 a ton, and on November 10 settled an account of $90 for unloading and delivery and paid back the money he had borrowed. How much did he clear?

Solution.—$19,000 ÷ $4.75 = 4000 tons bought.

Interest on $19,000 from March 30 to November 10 is

$593.75. So, $19,000 + $593.75 + $90 = $19,683.75, total cost of coal.

$4000 × $5.60 = $22400, selling price of coal.

$22400 — $19683.75 = $2716.25, gain.

6. If the interest on the sum of A's and B's money for 3 yrs. 9 mos., at 8%, is $3,213, and ⅔ of A's money is equal to ¾ of B's, how much has each?

Solution.—The interest on $1 for 3 yrs. 9 mos. at 8% is 30c; $3,213 ÷ .30 = $10,710, their combined sums. Now, let 16% = B's money, then 18% = A's, and 34% = both.

34% = $10,710.

1% = $315.

16% = $5040 B's.

10% = $5670 A's.

7. If I sold an article at 20 and 10 off and my discounts amounted to $3.50, how much did I get for the article?

Solution.—Discounts of 20% and 10% are equivalent to a straight discount of 28%. Therefore,

28% = $3.50.

1% = $.125.

100% = $12.50, list price.

$12.50 — $3.50 = $9, selling price.

8. What is mensuration? Make a list of the subjects considered under it in a complete grammar school arithmetic.

Note.—See any standard arithmetic.

9. A boat, in crossing a river one mile wide, drifted with the current 1000 yards; how far did it go?

Solution.—1 mile = 1760 yds., width of the river, which will be the base of a right angle triangle. 1000 yds. is the altitude of the triangle.

$\therefore \sqrt{(1000^2 + 1760^2)} = 2024.22$ yds. hypotenuse, or distance that the boat traveled.

10. Define three of the following: Circulating decimal; continued proportion; sight draft; ad valorem duty.

Note.—See any standard arithmetic.

JULY, 1907.

1. If I have room in my stable for a grain bin 8 ft. by 4 ft., how deep must I make it to hold 72 bu.?

Solution.—

$$\frac{2150.4}{1728} = 56\text{-}45, \text{ number of cubic feet in 1 bushel.}$$

$72 \times 56\text{-}45 = 448\text{-}5$, number of cu. ft. in the bin.

$8 \times 4 = 32$, number of sq. ft. in bottom of bin.

$\therefore 448\text{-}5 \times 1\text{-}32 = 2.8$, number of ft. in height of bin.

2. What sum of money at 6% simple interest will produce in 1 year and 6 months the same interest that $2700 will produce at 4% in 2 years and 8 months. Solve by proportion.

Solution— $18 : 32 :: \$2700 : X$

$6 : 4$

$1 : 1$

$$\therefore X = \frac{2700 \times 32 \times 4 \times 1}{18 \times 6 \times 1} = \$3200, \text{ principal as required.}$$

3. Simplify:

$$\frac{\dfrac{.33}{10 + 2\sqrt{225}}}{.0065 \times \dfrac{6\frac{3}{5}}{3\frac{9}{10}}}.$$

Solution.—

$$\frac{\dfrac{.33}{10 + 2\sqrt{225}}}{.0065 \times \dfrac{6\frac{3}{5}}{3\frac{9}{10}}} = \frac{\dfrac{\frac{33}{100}}{40}}{\frac{65}{10000} \times \frac{33}{5} \times \frac{10}{39}} = \frac{\frac{33}{4000}}{\frac{11}{1000}} = \frac{3}{4}.$$

4. A suspension bridge has four cables, each 1872 ft. long and 1 ft. 2 in. in diameter. The contract for painting their entire surface was let for $350. What was the price per square yard?

Solution.—

$$\frac{1\frac{1}{6} \times 3.1416 \times 1872 \times 4}{9} = 3049.4464, \text{ number of square yards}$$

in the convex surface of the four cables.

$\frac{(1\frac{1}{6})^2 \times .7854 \times 8}{9} = .95$, number of square yards in the eight ends of the four cables.

3049.4464+.95 = 3050.4 (nearly), the number of square yards in both convex surface and ends. Then,

$350 ÷ 3050.4 = $.1147 +, the price per square yard as required.

5. How much lumber will be required for the bin mentioned in problem one, 1-in. boards being used and the bin made without a top? What will be the cost at $28 per M?

Solution.—Making allowance for the corners, there will be two sides $8\frac{1}{6}$ ft. by 2.8 ft.; two ends 4 ft. by 2.8 ft., and a bottom $8\frac{1}{6}$ ft. by $4\frac{1}{6}$ ft. If the bin is constructed with lumber 1 in. thick, there will be $(8\frac{1}{6}+8\frac{1}{6}+4+4)\times 2.8=68+$, number of feet of lumber, board measure, in sides and ends. Then, $8\frac{1}{6}\times 4\frac{1}{6} = 34+$, number of feet of lumber, board measure, in the bottom.

68+34 = 102+, number of feet of lumber for the bin. Then,

$\frac{\$28\times 102}{1000} = \$2.856$, the cost as required.

6. A girl had $250 invested for her at 6%, on her birthday. When she became 21, it amounted, with interest, to $400. How old was she when it was invested?

Solution.—

$400 — $250 = $150, the interest.

6% of $250 = $15, interest for 1 year.

$150 ÷ $15 = 10, the number of years for which the money was loaned.

∴ 21 years — 10 years = 11 years, age of the young lady when the investment was made.

7. I bought 19 shares of 7% manufacturing stock at 128¾. On the same day I received a semi-annual dividend, and then sold for 126. No brokerage. What was my loss or gain?

Solution.—A 100-dollar share of the stock will cost $128.75.

A semi-annual dividend on one share will be $3.50.

$126 = selling price of one share. Then,
$126+$3.50=$129.50, amount realized from one share.
$129.50 — $128.75 = $.75, gain on one share. Then,
19×$.75=$14.25, total amount of gain on the stock.

8. Three commercial men having headquarters at Cleveland cover a circuit of towns in 10, 15 and 25 days respectively. If they leave at the same time, how many circuits will each have made when they all next meet at headquarters?

Solution.—The L. C. M. of 10, 15 and 25 is 150. Hence, if the men leave headquarters at the same time and continue traveling, they will all be at headquarters again in 150 days. Then, 150÷10=15, the number of trips the first man will have made; 150÷15=10, the number of trips the second will have made, and 150÷25=6, the number of trips the third will have made.

UNITED STATES HISTORY, INCLUDING CIVIL GOVERNMENT.

Answers by Prof. C. L. Martzolff, Ohio University, Athens.

AUGUST, 1906.

1. What was the condition of slavery in the colonies at the time of the framing of the Constitution? What has the Constitution to say with regard to the importation of slaves?

Answer.—(a) At the time of the Constitutional Convention all of the colonies held slaves except Massachusetts, where the institution had been abolished by the courts; Pennsylvania, where a gradual emancipation began in 1780; New Hampshire, Connecticut and Rhode Island, where the slaves were freed in 1784, and the Northwest Territory, where the Ordinance of 1787 prohibited slavery forever. (b) No slaves shall be imported into the United States after January 1, 1808.

2. What territorial dispute was the cause of the French and Indian war? How did the treaty which settled this war affect Spanish possessions in America?

Answer.—The English settled along the Atlantic coast. The French built a line of settlements and forts by way of the St. Lawrence and the Great Lakes into the Mississippi valley. This territory was claimed by England through the discovery of the Cabots, and the colonies claimed it through their charters. When the English climbed the Alleghenies and looked into the central West's valleys with a view to taking actual possession of them, their action was resented by the French.

In the Treaty of 1763 Spain gave Florida to England in return for Havana, Cuba, and the Philippine Islands, which England had captured during the war. France, by a secret treaty, gave New Orleans and all French claims west of the Mississippi river to Spain in order to compensate Spain for the loss of Florida.

3. Discuss education in the colonies.

Answer.—The Puritans early turned their attention to educational matters. In 1636 Harvard University was established at Newton, now Cambridge. In 1647 the General Court of Massachusetts ordered that a common school be established in every township of fifty families and a grammar school in each of the larger towns. In New York, New Jersey and Pennsylvania efforts were made to establish schools, but they fell below the New England schools, and there were but few outside of the towns and villages. In the South the education of the masses was almost wholly neglected except for some feeble efforts in Maryland and Virginia. The rich employed private tutors, and a few sent their sons to New England. There was no public school system in Virginia before the Revolution.

4. What arrangement was made in regard to the debts incurred by the several states in the prosecution of the Revolutionary war?

Answer.—By an act of Congress it was decided that the national government should assume the war debt of the several states.

5. What caused President Monroe to proclaim the Monroe Doctrine?

Answer.—The Holy Alliance, organized for the purpose of putting down rebellion in any of its forms, meant that Spain would be assisted by other European powers in holding the South American states under control. This caused President Monroe to make his famous declaration.—[Curtis' "United States and Foreign Powers."]

6. Describe briefly the personality of Andrew Jackson.

Answer.—Andrew Jackson was a tall, soldierly Southerner. He had risen by sheer force of character till he was no longer a poor white, but a Southern planter of great wealth and owning many slaves. But, though an aristocrat by profession, he was yet a democrat, the idol of rich and poor alike. He was the New West incarnate. While he might be considered a great leader, yet he is more the type of that spirit of democracy that permeated the central West in the first third of the century. His will was inflexible as steel. He reached his conclusions, then bent every

energy to execute them, and neither friend nor foe had power to change his purpose. His Cabinet were not advisers. They were the advised. They were the executors of his will. He was master in every sense of the word. He threw the personal element into every contest. He was not a partisan in any ordinary sense. A man may be a partisan and yet be the friend of his opponent. Jackson could not be. His party bent its will to that of its imperious master, and no czar ever ruled more firmly than did Andrew Jackson. His two administrations may well be called the reign of Andrew Jackson.

7. Discuss either the panic of 1837 or the presidential campaign of 1844.

Answer.—Jackson's Specie Circular, by which the payment for public land was to be made in coin, hastened the panic of 1837, for the people had very little coin with which to pay. The distributing of the surplus in the treasury to the various states and opening up a period of recklessness in spending money was another potent cause of the panic. All manner of wild speculations were rife, and gigantic schemes were hatched on every hand. People were intoxicated to the highest pitch with their dreams of wealth. Such an era of speculation could have but one result, and soon the crash came.

Polk was a dark horse candidate in the campaign which nominated him. The platform declared that Texas should be admitted and that Oregon should be held. It was a campaign of expansion. Clay, the Whig candidate, had hoped that Martin Van Buren would be his opponent. These two men stood together on the Texas question. But now the unknown Polk was running upon a platform that pleased both the North and the South. Clay began to trim his sails to the veering winds. He wrote some fatal letters, and the presidency for the third time slipped through his fingers.

8. Mention five generals of the Civil war and a battle in which each fought.

Answer.—George B. McClellan, Antietam; U. S. Grant, Vicksburg; George G. Meade, Gettysburg; Philip H. Sheridan, Winchester; Robert E. Lee, The Wilderness.

9. Give the leading events of the administration of Benjamin Harrison.

Answer.—(1) The Pan-American Congress. (2) The McKinley tariff bill. (3) Difficulties with Italy and Chili. (4) Ballot reform. (5) Homestead labor troubles.

10. Why are the following battleships mentioned in United States history: Constitution, Maine, Alabama?

Answer.—(1) The Constitution is one of the ships of the War of 1812. Her contest with the Guerriere is one of the historic battles of the century.

(2) The Maine was a United States warship which was blown to pieces in Havana harbor in the early spring of 1898. It hastened the Spanish-American war.

(3) The Alabama was a Confederate cruiser built by an English firm. It destroyed much commerce of the United States, for within a few months she took twenty-seven prizes. On June 19, 1864, in a fierce battle off the coast of France, she was captured, after having destroyed sixty-five vessels and $10,000,000 worth of property. This destruction was made the basis of claims by this government upon Great Britain, which were allowed by a court of arbitration.

SEPTEMBER, 1906.

1. What two nations undertook the settlement of the Connecticut river valley? Mention a fort or colony established by each. Tell something of the nature and significance of the Connecticut constitution.

Answer.—The Dutch and English both claimed the Connecticut valley for settlement. The Dutch had erected a fort at Hartford, but John Winthrop cut them off from the sea by building a fort at Saybrook, at the mouth of the Connecticut river. The three Connecticut towns, Hartford, Weathersfield and Windsor, united in one general government. The minister, Thomas Hooker, the prime mover in this union, preached a sermon in which he declared that the right to rule is found in the free consent of the governed and that the choice of officers belongs to the people. A constitution was drawn in 1639. It contained a provision for equal representation from the several towns and the choice of the governor and council to the vote of all the

free people, but it mentioned not a word about the king or Parliament.

2. Explain definitely what connection each of the following had with the early financial history of our country: Robert Morris, Alexander Hamilton.

Answer.—Robert Morris was a member of the ways and means committee of the Continental Congress and later served as superintendent of finance. Among his financial acts was the organization of the Bank of North America in 1781. As superintendent of finance he raised money for the government on his personal notes. He had at this time full control of the finances of the government.

As a member of Washington's Cabinet, Alexander Hamilton's reports on revenue, the mint, the bank, manufactures, etc., were of the utmost value in placing the finances of the country on a sound footing. In order to establish public credit, he carried, in spite of much opposition, a measure for the funding of the domestic debt, founded a national bank and rearranged the system of duties.

3. In whose administration were the Embargo and Non-Intercourse acts passed? Why were they passed, and what was their effect?

Answer.—The Embargo and Non-Intercourse acts were passed in the administration of Thomas Jefferson. They were retaliatory acts against France and England, and they served to ruin our merchant marine.

4. Mention one chief cause of each of the following wars: The war of the Revolution, the War of 1812, wars with the Barbary States, the French and Indian wars, the Spanish-American war.

Answer.—(a) Revolutionary war: The failure of the English Parliament to give to the American colonists the rights of Englishmen. (b) War of 1812: The constant incitement by the British of the western Indians against the Americans. (c) Wars with the Barbary States: The seizure of American vessels and holding the sailors for ransom. (d) French and Indian war: The dispute between France and England for the possession of the American continent. (e) Spanish-American war: America's sympathy for the Cubans in their efforts to gain their independence from Spain.

7. State the manner of obtaining office, the length of term of office and one chief duty of the President of the United States; the Adjutant General of Ohio.

Answer.—The President of the United States is elected by the Electoral College, which is elected by the several states. He is elected for four years, and one duty of his is to appoint subordinate governmental officers, by and with the consent of the Senate. The Adjutant General of Ohio is appointed by the Governor. He is the head of the Ohio militia.

8. What service did John Paul Jones render to this country? What recent event has served to recall this service?

Answer.—John Paul Jones during the Revolution took many prizes for the Americans from England. The removal of his body from Paris to the Naval Academy at Annapolis for re-interment serves to recall his illustrious services to this country.

9. Who were the candidates and what was the chief issue of the presidential election of 1896?

Answer.—William McKinley, of Ohio, and William J. Bryan, of Nebraska, were the leading candidates in 1896. The issue of the campaign was whether the United States should coin silver, free and in unlimited quantities, at its old ratio of "16 to 1."

10. What connection has each of the following with Ohio history: Anthony Wayne, John H. Morgan?

Answer.—Anthony Wayne, in the celebrated Battle of Fallen Timbers, so completely routed the Indians that they were glad to make a treaty with him in 1794. This peace allowed the rapid increase of settlement in Ohio at about the beginning of the century. General John H. Morgan, a Confederate cavalry leader, at the head of several thousand troops, raided through the southern counties of Ohio in 1863. He was captured in Columbiana county.

5. In Ohio, locate Fort Miami. Tell by what nation it was built and for what purpose.

Answer.—Fort Miami, the oldest fortification in Ohio, was built by a French expedition sent by Frontenac, Governor of Canada, in 1680, as a military trading post. It was about fifteen miles up the Maumee river from its mouth.

It stood on the left bank of the river in what is now Maumee City, Lucas county.

6. What territory was ceded to the United States by Mexico as a result of the Mexican war? How did the question of slavery come up in connection with this war, and with what result?

Answer.—The territory ceded to the United States as a result of the Mexican war consisted of what has since become the states of California, Nevada and Utah, part of Colorado and the largest parts of the territories of New Mexico and Arizona. The question of slavery took a prominent place in the results of the war. It was as to whether the new territory should be free or slaveholding. By the Missouri Compromise a part could not be slave soil, but there was a question about the remainder of it.

OCTOBER, 1906.

1. Describe briefly the settlement of the Carolinas.

Answer.—In 1663 Charles II granted to some of his favorites an indefinite tract of land south of the parallel of 36° 30′. To the grantees he gave almost unlimited power in the government of the colony, but before actual settlement had been made by them some Virginians had located themselves on the Chorvan river and thus established the beginning of North Carolina. A few years later the proprietors sent some colonists, who located on the present site of Charleston. This was the first settlement in South Carolina.

2. How was local government administered in Colonial Massachusetts; Colonial Virginia?

Answer.—In Massachusetts the old English parish, half political and half ecclesiastical, was reproduced in the New England town, which after a time lost its ecclesiastical function and became the political unit. This unit was a pure democracy, for here the adult male citizens would assemble in the town meeting to discuss local questions, lay taxes, enact laws and elect officers. The county in New England even to this day is of little importance politically.

In Virginia, the manner of settlement caused by the character of the people and the industrial conditions made

a larger unit necessary. The parish was at first the unit, but it soon gave way to the county, a still larger territory. The chief county officer was the sheriff, appointed by the Governor. The business of the county was mostly done by the "general court"; also appointed by the Governor. The only voice the people had directly in their government was the election of the members to the House of Burgesses.

3. In behalf of what issues was the eloquence of each of the following used: James Otis, Daniel Webster, Wendell Phillips, John C. Calhoun, Robert Hayne?

Answer.—James Otis resigned his position as King's advocate to take the opposite side of the question before the Massachusetts Superior Court, when the writs of assistance were being imposed upon the colonists: Daniel Webster, in 1830, in the United States Senate, replied to Robert Y. Hayne, against the right of nullification by any state or states; Wendell Phillips used his oratory in defending the Abolitionists and in opposing slavery; John C. Calhoun and Robert Y. Hayne both espoused the principle of state rights.

4. Mention two compromises incorporated into the Constitution.

Answer.—There were three compromises incorporated into the Constitution. (1) The small states should have the same representation in the senate as the larger states, and in the house of representatives the representation should be as to population. (2) Three-fifths of the slave population were counted as the basis of legislative representation. The slave states had wanted all to be counted. The free states wished none to be counted. (3) Congress was given control of commerce, which the New England states wanted. On the other hand the slave trade was not abolished till 1808, which suited the slave states.

5. What has the Constitution to say with regard to the importation of slaves?

Answer.—Art. 1, Sec. 9 of the Constitution says: "This immigration or importation of such persons as any of the states now existing shall think proper to admit, shall not be prohibited prior to the year one thousand eight hundred and eight, but a tax or duty may be imposed on such importation not exceeding ten dollars for each person."

6. What do you consider the most important battle of the Revolution? Why?

Answer.—The second battle of Saratoga is considered by Creasy as one of the decisive battles of the world. It is without doubt the most important battle of the Revolution. Among its results may be mentioned the increase of hope and courage on the part of the Americans, the breaking down of the royalist party in England and the securing of aid and acknowledgment of independence from France.

7. Explain what effect the Hartford Convention had upon the Federalist party.

Answer.—The War of 1812 was decidedly a Western war. The new West was rapidly being settled and coming into the control of the government. The action of the Hartford Convention, which was the general attitude of the Federalist party, lost that party all of its friends in the West and many in the East, and consequently lost it its power and hastened its death.

8. What effect did the fall of Fort Sumter have upon the North?

Answer.—The fall of Fort Sumter so enthused the people of the North that they at once fell into line regardless of party and went to the rescue of the flag.

9. After the close of the Civil War, what method of procedure was adopted with regard to the states which had composed the late Confederacy?

Answer.—The method of reconstruction followed the lines of argument of Thaddeus Stevens of Pennsylvania. It was to the effect that the seceded states had forfeited all rights under the Constitution and should be dealt with as conquered territory. To this end in February, 1867, the "Great Reconstruction Act" was made into a law. It provided that the seceded states should be divided into five military districts, over each of which there should be placed an officer with an army to supplant the civil government. A registration of all male citizens was provided and a test oath required of each. Those who took the oath became voters who might call a constitutional convention, to make a new Constitution, which was to be ratified by the people. The state would thereupon be re-admitted into

the Union after its legislature had endorsed the Fourteenth Amendment.

10. What was the Sherman Silver Act? Under whose administration was it repealed?

Answer.—The Sherman Silver Act required the government to purchase four and a half million ounces of silver bullion each month and to pay for it with notes redeemable in gold. The law was repealed in Cleveland's second administration.

NOVEMBER, 1906.

1. How long were the Articles of Confederation in effect? How were they deficient as an instrument of government?

Answer.—The Articles of Confederation were in effect from 1781 until April 30, 1789. There were no effectual means given to Congress of executing laws or of raising needful money. No power was given it to collect taxes directly from individuals, or to levy duties on imports. It could recommend and advise, but it could not execute. It lacked power over persons, consequently it lacked efficiency.

2. Who were the Iroquois; the Acadians; the Jesuits?

Answer.—The Iroquois were a group of Indian tribes that held the region south of Lakes Erie and Ontario. They formed the powerful confederacy of the Five Nations, and later the Six Nations.

The Acadians were the French inhabitants of Nova Scotia exiled by the British government during the French and Indian War.

The Jesuits were an order of priests formed by Ignatius Loyola, upon the principle of casuistry or the "justification of means by ends." This philosophy made them conscientious but often extremely unscrupulous and untiring laborers in whatever they undertook. They were as a consequence great missionaries and incidentally great discoverers and explorers.

3. What caused the passage of the Kentucky Resolutions? What doctrine did these Resolutions assert with regard to the government of the Union?

Answer.—The passage of the Alien and Sedition laws in 1798 was the occasion for the Kentucky resolutions, written by Jefferson. These resolutions asserted that when a law which contravened the Constitution of the United States was passed, there was but one remedy, and that was nullification by the states.

4. With regard to the following sieges, give date, names of besieging generals and result: Yorktown. Vicksburg.

Answer.—Yorktown, October, 1781. Washington and Lafayette. Surrender of besieged British army.

Vicksburg, May and June, 1863. Grant and Sherman. Surrender of Confederate army of 29,000 men.

5. State definitely the views of Henry Clay, John C. Calhoun and Stephen A. Douglas with regard to slavery.

Answer.—Henry Clay recognized the right of slavery to exist, and his whole life was spent endeavoring to harmonize the anti-slavery and pro-slavery elements of the country.

John C. Calhoun is quoted as saying: "Slavery forms the most solid and durable foundation on which to erect free institutions."

Stephen A. Douglas also recognized the right of slavery to exist, but he believed in the democratic principle that each state should decide for itself whether there should be slaves or not within its confines.

6. Write briefly of the settlement of Ohio and its admission to the Union.

Answer.—Ohio was permanently settled at Marietta in the spring of 1788 by the Ohio Company of Associates. A year later a settlement was made at Cincinnati, and in another year Gallipolis had been settled by the French. The disastrous defeats by the Indians of Generals Harmar and St. Clair retarded for awhile the development of the country. The signal victory of Wayne at Fallen Timbers in 1794 gave an impetus to settlement that has never been equalled. The banks of the rivers were soon dotted with towns, and in 1802 the people of Ohio were authorized to form a state government. On November 30 of the same year a constitution was adopted, and on March 1, 1803, the territorial officers gave way to the newly-elected state officials, and Ohio became a state.

7. What is impeachment? Why was President Johnson impeached?

Answer.—An impeachment is a charge brought against a public official for dereliction of duty or the commission of some misdemeanor or act not in conformity with the law.

President Johnson was impeached on the charge of having disobeyed the tenure-of-office law.

8. Mention important events in the administration of President Hayes.

Answer.—The Hayes administration is noted for the withdrawal of the Federal troops from the Southern states, the rise of the Greenback party, the strikes and riots of 1877 and the resumption of specie payments in 1879.

9. Name a famous American orator, educator, jurist, novelist and humorist of the nineteenth century.

Answer.—Daniel Webster stands without a peer as an American orator. Horace Mann is recognized as one of the greatest educators. John Marshall holds the palm as a jurist. Nathaniel Hawthorne stands alone as a representative novelist, and Mark Twain is a famous humorist.

10. Name five objects of the Constitution as stated in the preamble.

Answer.—(1) To form a more perfect union.
(2) To establish justice.
(3) To insure domestic tranquility.
(4) To provide for the common defense.
(5) To promote the general welfare.

DECEMBER, 1906.

1. What was the English plan of colonial government as exemplified in America.

Answer.—The royal or provincial government was, no doubt, the English ideal of governing colonies. By the time of the Revolution all the colonies except Rhode Island and Connecticut had passed into this form of government. The reason is obvious. This system gave the crown more authority. The king appointed the governor and the legislative council. The assembly was elected by the people, and its acts were subject to the gubernatorial veto. The governor had almost unlimited power. As a representative

of the king he was in himself a little king, wielding kingly prerogatives. These provincial colonies are often divided into royal and proprietary. Their government, however, as far as the colonies were concerned, was essentially the same.

2. Locate at least three permanent settlements founded in Ohio prior to 1800.

Answer.—Marietta, founded in 1788; Cincinnati, 1789; Cleveland, 1796.

3. Name the treaty which closed the Revolution and state some of its provisions.

Answer.—The Treaty of Paris, 1783. Terms of treaty: Recognition of the independence of the United States; national boundaries recognized, as Florida on the south, Mississippi river on the west and the southern boundary of Canada on the north. The Mississippi was left open to both American and British shipping: Americans were given the right to fish on the Newfoundland banks and in the Gulf of St. Lawrence, but British subjects could not fish in American waters.

4. Explain in full the qualifications and method of electing United States Senators.

Answer.—No person shall be a Senator who shall not have attained the age of thirty years and been nine years a citizen of the United States and who shall not when elected be an inhabitant of that state for which he shall be chosen.

A Senator is elected by the General Assembly of the state, both houses of which meet in joint session, after each party in a caucus has nominated a candidate. A majority vote is necessary to elect.

5. Make a table of the Presidents of the United States from 1836 to 1860, indicating the political party to which each belonged.

Answer.—Martin Van Buren, Democrat; William Henry Harrison, Whig; John Tyler, Whig; James K. Polk, Democrat; Zachary Taylor, Whig; Millard Fillmore, Whig; Franklin Pierce, Democrat; James Buchanan, Democrat.

6. What was the Compromise of 1850? Name some Northern statesmen who were opposed to it.

Answer.—The Compromise of 1850 provided:

(1) The New Mexico-Texas boundard was to be established, and Texas was to receive $10,000,000 for giving up her claims.

(2) California was to be admitted as a free state.

(3) New Mexico and Utah were organized as territories without restrictions as to slavery.

(4) The arrest and return of fugitive slaves was provided for.

(5) The slave trade in the District of Columbia was abolished.

The leader of the opposition was William H. Seward, of New York. He was ably seconded by Salmon P. Chase, of Ohio.

7. How many amendments have been made to the United States Constitution since the Civil war? Give briefly the purpose of each.

Answer.—There have been three amendments to the Constitution since the Civil war, the Thirteenth, Fourteenth and Fifteenth.

The purpose of the Thirteenth was to abolish slavery; of the Fourteenth was to make the slave a citizen, determine the political status of persons who had been in rebellion and to disavow the payment of any debt that had been made in aid of insurrection; the Fifteenth gave the right to vote to all citizens regardless "of race, color or previous condition of servitude."

8. What was the last important Indian outbreak with which the United States has had to deal? What famous general was killed in this outbreak?

Answer.—The last Indian outbreak of any importance was that of the Sioux Indians, in 1876, when General George A. Custer, an Ohio man, and his entire command were killed on Little Big Horn river, in Montana.

9. Discuss the presidential election of 1876 under the following heads:

(a) Why Grant failed to receive the Republican nomination.

(b) Chief issue of the campaign.

(c) Contest of the election returns.

Answer.—(a) The third term agreement, with the unearthing of corruption during his administration, convinced the Republican leaders that he would not be a popular candidate. Grant, too, had made many personal enemies in the ranks of the Republican party.

(b) The Democratic slogan was "Reform." The Republicans were clearly on the defensive and, in the language of Mr. Hart, proceeded to wave the "bloody shirt"—that is, the charge of the disloyalty of the South and its friends during the Civil war.

(c) On the morning after election day Tilden appeared to have 203 votes and Hayes 166, and on the popular vote Tilden had a plurality of 250,000. The Republicans, however, at once claimed that the legal votes of South Carolina, Florida, Louisiana and Oregon were for their candidate, and that the Republican Senate was to make the count and decide the contest. The Democratic House insisted that the two houses must unite in counting the vote.

The question was complicated, because in the three disputed Southern states many Democratic ballots were thrown out. On the other hand, everybody knew that if the negro voters in the South had been freely allowed to vote they would assuredly have carried these states for Hayes. As March 4 approached without a settlement of the dispute, public excitement ran high. After fierce discussion, an act was passed (January 29, 1877) for a special electoral commission of fifteen members—seven Republicans, seven Democrats and (it was expected) one independent. Instead of the independent, a Republican was chosen, and on every one of the disputed questions, by a vote of eight to seven, the commission decided for the Republican contention.—Hart's Essentials in American History.

10. Mention one office which Theodore Roosevelt has held in city, state and national politics.

Answer.—Theodore Roosevelt was Police Commissioner in New York City, Governor of the State of New York and Vice-President of the United States.

JANUARY, 1907.

1. Name three explorations conducted in America under the flag of Spain.

Answer.—The explorations of De Soto (1539-41), De Narvaez (1528) and Balboa (1513).

2. Compare the early settlers of Georgia with those of Connecticut.

Answer.—The early settlers of Connecticut were the most democratic of the New England settlers. They had passed out from Massachusetts for the same reason that Massachusetts had passed out from England. They were people of steady habits, deep religious feeling and lovers of liberty. They were the best of the Puritan blood.

The Georgians, on the other hand, belonged not to the great middle class of England, but were of the unfortunate pauper and debtor class. The jails of England were opened to build the Georgia colony. But later many Huguenots came to form the new state.

3. Name three engagements of the Revolution in which Washington took part, and state the results of each.

Answer.—Battle of Trenton; American victory. That was more of an inspiration to the colonial army and the people than any real military significance.

Battle of the Brandywine. On the face, British success, but in reality an American victory. Washington, by a masterful strategy, had succeeded in delaying Howe, in order that he could not coöperate with Burgoyne. When the battle was over and Howe was free to move, Burgoyne had surrendered at Saratoga.

Battle of Monmouth an indecisive American victory, owing to the treachery of General Charles Lee.

4. Discuss American relations with France during the presidency of John Adams.

Answer.—France felt the bitterest resentment over the Jay treaty because it gave privileges to England which were denied France. In retaliation the French began to seize American vessels. Charles C. Pinckney, our minister to that country, was not received by the Directory, and he was warned to leave the country. The President sent a special commission to make a last effort to effect a recon-

ciliation, for Mr. Adams did not want to plunge the country into war at the time. The French government refused to officially receive the commissioners. They were waited upon and informed that a quarter of a million dollars as a bribe to the Directory would bring about a treaty. This was peremptorily refused, and our country prepared for war. But at this time Napoleon overthrew the Directory and became dictator of France. He could see no advantage in fighting the United States and was willing to negotiate a treaty, which was effected in 1800.

5. Show that Monroe's administration has been wrongfully called a political Era of Good Feeling.

Answer.—The old Federalist party had died after the War of 1812. In 1816 the candidate of that party received but thirty-four electoral votes. While Monroe, as well as his rivals, called themselves Republicans, yet they had many of the old Federalist principles. It was a time for personal playing for place and power. The Federalists could no longer hold together as a party, and the various leaders could not get together close enough to unite their opposition to the President. Henry Clay, speaker of the House, was always a critic of the President's policy. Because Mr. Monroe was re-elected in 1820 without opposition the period has been called that of Good Feeling, "though in reality it was a time of intensely bad feeling, of jealousy, of bitterness, intrigue and sharp disagreement."—Hart's Essentials of American History.

6. For what principles did the Wilmot Proviso declare?

Answer.—The Wilmot Proviso stood for the principle that Congress had power to control slavery in the territories of the United States. It intended to exclude slavery from any territory that might be secured from Mexico as a result of the war with that country.

7. Give the substance of two amendments to the Constitution that relate to the negro.

Answer.—Neither slavery nor involuntary servitude, except for crime, shall exist in the United States. Or the right to vote shall not be abridged or denied on account of race, color or previous condition of servitude.

8. Compare the resources of the North and South at the beginning of the Civil war. At the present time.

Answer.—In 1860 the Northern states had 19,000,000 and the slave-holding states 12,000,000 inhabitants. When the crisis came, four of the slave-nolding states adhered to the Union, with a population of 3,100,000. About 500,000 of these remained with the South. West Virginia and East Tennessee stood with the Union, giving the Southern people there three and one-half million slaves and 140,000 free negroes. Of the men between eighteen and sixty years of age the South had 1,400,000, while the North had nearly 5,000,000. In the North there was twice as much land under cultivation as in the South. The North raised all of its food, while the South had but one staple crop.

While the North is yet the more populous and the wealthier of the two sections, the disparity, in proportion to the population and area, is becoming less and less.

9. Summarize briefly the political career of James G. Blaine.

Answer.—James G. Blaine was born in Pennsylvania, spent his boyhood in Lancaster, Ohio, settled in Maine, went to Congress in 1863, was Speaker of the House from 1869 to 1875, and then became Senator from Maine. He was a strong partisan, and his enemies were legion. He was too aggressive to be a diplomat. In 1876 he was candidate for the presidency before the Republican convention. Four years later he was competing again, this time with General Grant. In 1884 he was nominated, but the disaffection in the Republican ranks caused Cleveland's election. Upon the election of Harrison in 1888 Blaine was made Secretary of State. He had held this same position under Garfield. In 1892 he allowed his name to go before the Republican convention in opposition to Mr. Harrison for his second term.

10. Explain the present method of government of the Philippine Islands.

Answer.—The Philippine Islands are of the class of territories that the Supreme Court of the United States has declared as "belonging to" the United States. This class is governed by the military or naval authorities or by special commissions.

FEBRUARY, 1907.

1. (a) Name two beliefs concerning the nature of the globe that were held by Europeans of Columbus' time.

(b) Name two causes that led to the establishment of settlements in America.

Answer.—(a) Among learned men of Columbus' time the old theories of the earth had been pretty well exploded, but there were two accepted conjectures to which the people generally clung. One, the Oceanic theory, in which it was believed that the outer unknown world was composed chiefly of water. The other was the Continental theory, viz, that Asia extended indefinitely to the northward, while Africa stretched itself interminably to the south, and the two continents finally met on the other side of the globe.

(b) Religious and industrial conditions in Europe.

2. What part of America was explored by Balboa, Cabot, Lewis and Clark? Give the approximate date of the explorations of each.

Answer.—Balboa, while exploring the Isthmus of Panama, discovered the Pacific ocean in 1513.

John Cabot discovered continental North America along the coast of Labrador in 1497.

Lewis and Clark, at the request of President Jefferson, explored the Oregon country in 1804-05.

3. In the Revolution, how did the British plan to get possession of the South? Why did their plan fail?

Answer.—There were many loyalists in the Southern states, particularly in the Carolinas and Georgia. The British expected substantial help from this source, and in this they were not disappointed. They hoped to get these states under their control and then hold them while they dictated terms to the rest of the country. The first part of the plan succeeded, and had it not been for the guerrilla warfare carried on by Marion and others the scheme would ultimately have succeeded.

4. Discuss briefly British impressment of American seamen under Washington's administration.

Answer.—Many English sailors abandoned their own ships and took refuge on American vessels. England would

not recognize the right of expatriation, and she held up American vessels and seized these men at every opportunity. Many times native born Americans would be taken. When Jay formulated his treaty with England in 1795, he attempted to get in a clause in reference to this matter, but he was unsuccessful.

5. When was the Louisiana Purchase made? Name four states formed from this territory.

Answer.—The Louisiana Purchase was effected in 1803. Four states that were carved from this territory are Arkansas, Missouri, Iowa and Kansas.

6. Why would it have been inadvisable for Lincoln to issue the Emancipation Proclamation earlier than in 1863?

Answer.—The war was not begun for the purpose of destroying slavery. There were many loyal Northern people who were willing to fight for the Union, but not for slaves. Had Lincoln used his doubtful power of emancipating the slaves in the early stages of the conflict, there is great doubt if it had been sustained by popular opinion. As it was, there was considerable weakening in support of the administration, as the fall elections would seem to indicate.

7. Give an account of one of the following: The Battle of New Orleans (1815); the capture of New Orleans (1862)

Answer.—(b) General B. F. Butler commanded the land forces, while the naval armament was under Commodore Farragut. Captain Porter, with a strong fleet of bomb vessels, accompanied the Union squadron. The Union fleet consisted of forty-seven vessels. The city was defended by two powerful forts, while the river between the forts and the city was filled with ironclad gunboats and rams. The bombardment of the forts lasted five days. A great chain had been stretched across the river to prevent the passing of the Union boats. When the chain was broken, Farragut pushed his vessels past the forts and through the midst of the various craft, while from the shore and from every conceivable craft volley after volley of shot and shell was poured on the passing vessels. Then came the encounter with the Confederate fleet, which was short and decisive, and the historic Creole city lay at the feet of the Northern conquerors.

8. What is meant by the "spoils system"? When was it introduced? What was the attitude of President Hayes toward this system?

Answer.—By "spoils system" is meant the retirement of public officials whose politics differ from that of the appointing power. General Andrew Jackson usually gets the credit for its introduction when he became the seventh President of the United States.

President Hayes was not a friend of the "spoils system" and throughout his term of office made strenuous but futile efforts to re-establish the civil service reform movement.

9. Explain the process of naturalization.

Answer.—The alien desiring citizenship must appear before a court of record at least two years before admission and there declare under oath his intention of becoming a citizen and renounce his allegiance to any other government. Two years later he again appears in court. Must prove that he has resided continuously in the United States for five years past and that he has behaved as a moral man. He then takes the oath of allegiance to the United States and swears to support its Constitution and laws.

10. When and how did Hawaii come to be annexed to the United States?

Answer.—On July 7, 1898, the Hawaiian Islands were formally annexed to the United States by a joint resolution of Congress, as in the case of Texas.

MARCH, 1907.

1. Explain fully why Roger Williams was banished from Massachusetts. What settlement did he found?

Answer.—Roger Williams, a graduate of Oxford, was for two years minister at Plymouth and then became pastor at Salem. Williams laid down what seems now the obvious doctrine that the civil government has nothing to do with religious acts and that everyone should have liberty to worship God as he sees fit. For taking this attitude Williams was banished from the colony in January, 1636. The settlement he founded was Providence, Rhode Island.

2. How did each of the following obtain its name: Carolina, Plymouth, Virginia, Lake Champlain, Baltimore?

Answer.—Carolina had been named by Ribeaut, the Huguenot, about 1560, in honor of Charles IX of France. When Charles II of England granted this country to a company, the name was retained in his honor.

Plymouth, England, was where the Pilgrims re-embarked for the New World. The landing place received the name from the embarking place.

Virginia was named in honor of Elizabeth, the "virgin queen" of England.

Lake Champlain received its name from its discoverer, in 1607.

Baltimore takes its name from Lord Baltimore, the founder of Maryland.

3. Explain the importance of the defeat of the Hessians at Trenton.

Answer.—Before the Battle of Trenton the patriot cause was at a very low ebb. Many of the important places were held by the British. The enlistment period of the men was expiring, and the little army was dwindling. In the midst of this general gloom the victory at Trenton came to cheer and hearten the downcast Americans. The campaigns against the British were waged with renewed effort.

4. When, how and with what effect did France recognize the colonies as an independent nation?

Answer.—February 6, 1778. France and the United States concluded a secret treaty by which a compact of friendship was entered into, to be made public when England declared war against France. This was the virtual recognition of the government of the new nation. The effect was to hasten the close of the war and bring England to her senses. Overtures were at once made to the colonies. A bill to yield everything that had been asked for passed both houses of Parliament and was signed by the king. But it was too late.

5. What was the condition of the United States with regard to (a) commerce, (b) finances and (c) prestige at the close of the War of 1812?

Answer.—After the War of 1812 our commerce was virtually destroyed, but it caused us to turn to internal im-

provement and the development of our national resources. Whatever commerce we had left was an independent one. The finances were in bad condition. Our currency had been so debased as to threaten every business interest in the country. But our prestige was enhanced. Before the war the United States was never considered a first rate power; since then it has never been considered anything else. At home our people for the first time began to conceive a national consciousness.

6. When and with what conditions as to slavery was each of the following states admitted to the Union: Ohio, Texas, Missouri?

Answer.—Ohio was admitted in 1803. No mention of slavery was made, for it had already been prohibited in the Ordinance of 1787.

Texas was admitted in 1846. It was admitted by joint resolution of Congress. Since Texas was a slave-holding republic it was allowed to come in with its slaves.

Missouri came into the Union in 1821 under the famous compromise. It was specifically admitted as a slave state.

7. At the opening of the Civil War it was one of the government's objects to secure control of the Mississippi river. Show how this was or was not accomplished.

Answer.—The opening of the Mississippi began on the part of the Union forces when the Confederate line was broken in the West by the capture of Fort Henry on the Tennessee and Fort Donelson on the Cumberland in the spring of 1862. New Madrid and Island No. 10 were strongly held by the Confederates as advanced posts on the Mississippi river. These places were both taken early in the spring of 1862. The Confederates now fell back upon another line of defense extending from Memphis eastward through Corinth. At the latter place Grant won a signal victory on April 6, and the second line was broken. Memphis was next taken, and the Mississippi was free to the Union gunboats as far south as Vicksburg. At the same time Farragut proceeded to open the river from the south. New Orleans was protected by strong forts. Six days' bombardment from the Union fleet accomplished the fall of the city, and the boats passed up the river. Port

Hudson and Vicksburg were now the only places left in Confederate hands on the Mississippi. Grant now laid siege to the latter place. In seven weeks the inhabitants were starved into surrender, and on July 4, 1863, the stars and stripes floated over the defenses of Vicksburg. Four days later Port Hudson fell, and "The Father of Waters rolled unvexed to the sea."

8. Describe the nature and effect of "carpetbag government" in the South.

Answer.—The enactment of the Fifteenth Amendment made the ex-slave a voter. The white man who had participated in the rebellion had no vote. Disreputable whites from the North went South and assumed the leadership. They held the offices to which the negro elected them. The government was necessarily bad. Iniquitous laws were enacted, heavy taxes were levied on white men's property, vast sums of money were wasted, and state debts were enormously piled up. The natural effect was that efficient "reconstruction" was retarded. It gave rise to the notorious Ku Klux Klan. It prolonged the bitterness engendered between the sections by the rebellion. It made the "race problem." It made a solid Democratic South.

9. Give, in substance, the Fifteenth Amendment to the Constitution. In whose administration was it passed?

Answer.—"The right of citizens of the United States to vote shall not be denied or abridged by the United States, or by any state, on account of race, color or previous condition of servitude." It was passed in Andrew Johnson's administration.

10. Mention three methods of raising money for the federal government.

Answer.—1. By imposts. 2. By excises. 3. Direct taxes.

APRIL, 1907.

1. Give a brief account of an unsuccessful attempt by the English to found a colony in North America.

Answer.—In 1579 Sir Humphrey Gilbert, assisted by his half-brother, Walter Raleigh, endeavored to effect a settlement in Newfoundland. This proved unsuccessful, as did a later one in 1583. Raleigh attempted to make a settlement

in a more favorable region farther south. In 1584 two vessels were sent on an exploring expedition. The coast south of Chesapeake bay was selected as a favorable locality, and the name Virginia was given to the region. The next year a company of settlers was sent out, and settlement was made on Roanoke Island. This colony was a failure, as was another one in 1787. This last one is known as the "Lost Colony."

2. What was the New England Confederation? How long did it exist?

Answer.—The New England Confederation was effected in 1643 for the purpose of protection from the Indians and to retard the encroachments of the Dutch. It consisted of the colonies of Plymouth, New Haven, Connecticut and Massachusetts. Later New Hampshire became a member of the union. Rhode Island was not allowed to join on religious grounds. The union lasted forty years.

3. Give the purposes and result of Braddock's expedition of 1755. What part did a future President take in the expedition?

Answer.—Braddock's object was to take Fort Duquesne from the French, march north along the Allegheny river, capture the line of forts upon its banks and join the other English forces at Niagara.

When the English soldiers became panicstricken, Washington covered their retreat with his Virginia militia. Here he won his first spurs as a soldier.

4. Who were the leading British and colonial generals at the beginning of the Revolution? At the close of the Revolution?

Answer.—British generals at beginning of war: General Gage, General Howe, General Burgoyne. At the close of the war: Lord Cornwallis, General Clinton.

American generals at beginning of war: General Putnam, General Prescott, General Washington and General Gates. At the close of war: Washington, Greene, Marion and Morgan.

5. When and how were Washington and Oregon settled?

Answer.—Americans claimed the Oregon country because of the discovery of the Columbia river by Captain

Grey in 1792, because of the explorations of Lewis and Clark and because of the actual settlement immediately after the last event. The American fur traders went to Astoria in 1811, and from that time onward the emigrant wagon pursued its course across the Rocky mountains to the valley of the Columbia. The question that arose in 1845 was regarding the reoccupation of the Oregon region.

6. Give a short account of one of the following: The state of Frankland, Shay's Rebellion, the building of the National road.

Answer.—After the Revolution the Southwest filled rapidly. In 1784 the settlers on the upper Tennessee met in convention at Jonesboro, voted to establish the state of Franklin or Frankland, elected John Sevier Governor, chose a Legislature, made laws and defied the jurisdiction of North Carolina. The people only returned to their allegiance under the promise that North Carolina would transfer the territory to the United States.

Shay's Rebellion, in Massachusetts in 1787, was one of the manifestations of the unrest in the colonies after the Revolution and before the establishment of a stable government under the Constitution. Taxes were high, there was little money, and laws were especially severe upon the debtor class. As a protest against suits for debt against farmers, rioters in certain Massachusetts towns prevented the judges from holding court. This movement grew in strength, and it reached its climax when Daniel Shays, with 1800 men, attacked the arsenal at Springfield. The state militia was called out and the rioters dispersed.

In 1806 a survey of a road was made from Cumberland, Maryland, to the Ohio river. Work of construction began at once. In 1820 this Cumberland road or National road was opened to Wheeling, continued westward to Columbus and Indianapolis. This at once became the artery leading to the West. In 1850 the general government transferred its ownership to the several states.

7. Explain the formation of the state of West Virginia.

Answer.—During the Civil war some forty counties of western Virginia elected a Governor and sent Representatives to Congress. Since a state cannot be divided without

its own consent, this new government was considered the bona fide one for Virginia and was recognized as the proper one to give consent to the division of the state. A constitution was formed and ratified in 1862, and in the following year West Virginia became one of the states of the Union.

8. What purpose with regard to slavery did Lincoln express at the beginning of the Civil war? How and why did he change this purpose?

Answer.—In his inaugural address Lincoln declared that he had no purpose, directly or indirectly, of interfering with slavery where it existed, and affirmed his belief that he had no legal right so to do; he was willing that the Fugitive Slave law should be enforced. He even went farther and signified his willingness that an amendment should be made to the Constitution making slavery perpetual in the United States, but it should remain where it was. It should not be extended. Lincoln's mind was changed through the Civil War and his new attitude was taken as a "war measure."

9. Explain the method of electing the President of the United States.

Answer.—Congress has decided that the qualified voters of the several states shall on the first Tuesday after the first Monday of November every four years select electors. These electors meet in their respective state capitals on the second Monday of the following January and then vote for someone as President and someone as Vice-President. The result is then certified to and transmitted to the president of the Senate. There, in the presence of both houses of Congress, the votes are counted and the result verified.

10. Explain the relations which have existed between the United States and Hawaii since 1893.

Answer.—In January, 1893, the government of Hawaii was overthrown by revolutionists, and a provisional government was set up. A treaty to annex the islands to the United States was at once drafted and sent to Washington. President Harrison, just before his retirement from office, sent this treaty to the Senate for confirmation. Upon the advent into the presidency of Mr. Cleveland, he at once

withdrew the treaty and sent a commissioner to the islands to investigate, and upon learning the facts he sent another member to haul down the flag. Cleveland acted on the principle that we have no right to assume the government over a people without their consent. Afterward, when the new government of Hawaii became stronger, it was recognized as a republic, and on July 7, 1898, the Hawaiian Islands were annexed to the United States by joint resolution of Congress.

MAY, 1907.

1. Give a brief history of the English settlement at Jamestown in 1607.

Answer.—The London Company, which had been chartered in 1606 by King James of England, sent out in December of that year 120 emigrants, who arrived at Chesapeake bay the following May. They selected a peninsula on the James river for their settlement, which they called Jamestown. It was a marshy, mosquito-infested region and had no natural means of defense against the Indians. The most picturesque figure in Jamestown history is Captain John Smith, a son of adventure, whose fast career and success in getting out of intricate places fitted him for leadership in a discouraged, disease-haunted colony. To him more than to any one else is due the life of the settlement. The beginning of Virginia is a tragedy of famine and death; of 630 colonists, 570 died in less than three years. It was a constant struggle for existence until 1616, when the communistic idea was set aside and individual effort was recognized.

2. Give the distinguishing features of colonial government in Massachusetts and in Virginia.

Answer.—Each colony had its governor and a lawmaking body, consisting of the Council and the Assembly. The Council was the governor's body of advisers. They aided the governor in executing his duties and generally took part in making laws. The Assembly was elected by the people and was therefore the stronghold of their rights. It alone could levy taxes, and in this way it controlled the public money. The governor was appointed in both colonies by the king.

In the matter of local government there was a difference. The old parish of England became the town of Massachusetts. The town was a legal corporation, was the political unit and was represented in the General Court. It was a democracy of the purest type.

In Virginia the county, first called the shire, was the unit of representation. At first the parish was the local unit, but it soon gave way to the county. Local government, judicial and administrative, was chiefly in the hands of a county court, which was appointed by the governor. The town meeting of Massachusetts was paralleled by the "court day" of Virginia.

3. Describe Washington's career prior to the Revolution.

Answer.—Washington as a youth was a surveyor on the lands of Lord Fairfax. In 1753 he was sent by Governor Dinwiddie of Virginia as a messenger to the French commandant at Fort le Boeuf. The next year, in command of a small body of Virginia militia, he attacked a body of Frenchmen at Great Meadows, which virtually opened the French and Indian war. The next year we find him saving the army of the ill-fated Braddock. During the remainder of the war he took no part. He retired to his plantation and was soon afterward elected to the Virginia House of Burgesses. From this time until he was called to take command of the Continental army, in 1775, he was interested in his plantation and the development of western lands. In 1770, in company with Colonel Crawford, he visited the Ohio country and became owner of vast regions along the Ohio valley.

4. On what occasions during the Revolution was the aid rendered by the French most beneficial to the colonists?

Answer.—The money given by France and her recognition of American independence, coming as it did just after the terrible winter at Valley Forge, was certainly beneficial to the disheartened colonists, although the surrender of Burgoyne at Saratoga furnished a rift in the clouds. Finally, in the Yorktown campaign, the French fleet and French army, acting in conjunction with Wash-

ington's army, made it possible for the successful issue of the campaign.

5. How did the United States suffer from the war waged between England and France during Jefferson's administration?

Answer.—England forbade France trading with her colonies. France allowed the neutral nations to do the trading. America at once developed a huge trade with the West Indies, and since all of Europe was embroiled in the war America became the carrier of the world. England now revived an old rule of 1756, by which a neutral was not permitted to enjoy in time of war that which she does not enjoy in time of peace. In 1806 Napoleon issued his Berlin Decree, forbidding any vessel that touched at an English port from entering a French port or of her allies. Then England, without waiting to see what the neutral nations would do, issued an order in council closing to neutrals all ports under French control. By these measures the commerce of the United States was well nigh destroyed.

6. Give the location of Gettysburg and state the importance and outcome of the Gettysburg campaign in the Civil War.

Answer.—Gettysburg was a village of 1500 people, in Adams county, Pa., twelve miles east of the South mountain range. The Battle of Gettysburg was the result of Lee's attempted invasion of the North. The importance is evident. The transference of the seat of war would put the North on the defensive and carry the horrors of war into the enemies' country. The defeat of Lee turned the tide of war, and it was continued south of the Potomac.

7. How were the seceding states governed immediately after the Civil War?

Answer.—Between the close of the war and the meeting of Congress in the autumn of 1865 the seceding states were operating under a provisional government, which had been set in operation by Mr. Lincoln. The method used was that a state might resume its place in the Union when one-tenth of the number of the voters of 1860 had

taken the oath of allegiance and had set up a state government. The national military force was used in sustaining these governments. Mr. Johnson continued Lincoln's plan of reconstruction, and by the middle of July, 1865, each of the seceded states had its legislature at work and "everything was moving in apparent harmony." The meeting of Congress in the following December upset this harmony.

8. What method was employed to settle the Hayes-Tilden election dispute?

Answer.—It was left to an electoral commission of fifteen members, consisting of equal members from the Senate, House of Representatives and the Supreme Court.

9. Give the substance of two amendments to the Constitution that have to do with the negro.

Answer.—The Thirteenth Amendment abolished slavery in the United States, and the Fifteenth Amendment gave to the negro the right to vote.

10. Explain what is meant by the Civil Service. What are its advantages?

Answer.—The object of the Civil Service is to find men who are capable of holding official positions. Its advantages are found in the selection of men based upon merit and not upon political prestige.

JUNE, 1907.

1. Give the number and character of the original colonists at New Amsterdam, Jamestown, Providence.

Answer.—The growth of New Amsterdam was extremely slow, for within five years of the settlement there were less than 300 colonists. They were not the best class of Hollanders. The liberties and self government of New Amsterdam were extremely limited, while in Holland itself the people enjoyed the full realizations of civil and religious liberties. It is evident therefore that the character of these first colonists was not of the best.

There were 105 voyagers on the ships that brought the settlers to Jamestown. These people were for the most part soldiers of fortune and "gentlemen of misfortune," who came to Virginia out of a spirit of adventure and with the desire to obtain wealth easily.

The settlers of Providence consisted of Roger Williams and five companions. They were malcontents from Massachusetts who could not get along there and who could not agree among themselves. But they stood for the principles of liberty and freedom of conscience.

2. Summarize events in America between the passage of the Stamp act and the Battle of Concord.

Answer.—After the repeal of the Stamp act the British Parliament passed the celebrated Townshend acts, which laid a duty on tea, paints, paper and glass, etc. To these there came a volley of colonial protests. Addresses were made and pamphlets were written and non-important agreements were entered into. Troops were sent to Boston. The Townshend acts were modified. Then came the Boston massacre, followed by the organization of the Committee of Correspondence. The irritated colonials then burned the Gaspee and threw the tea into Boston harbor. Then came the five Intolerable acts of Parliament, and General Gage was sent to Boston to enforce them.

The First Continental Congress now met and issued a "Declaration of Rights," framed articles of association and approved the attitude of the citizens of Boston and made provision for the assembling of Congress the following year.

3. Was Washington greatest as a general or as a statesman? Why?

Answer.—"We do not class Washington among the greatest warriors of history. He lacked the brilliant genius of a Hannibal, a Caesar, or a Napoleon. He is especially remembered for his Fabian policy, and yet his operations at Trenton and Princeton, his well planned attack at Germantown so soon after the defeat at Brandywine and his stealthy march upon Yorktown, all must be classed among the most brilliant movements in the history of warfare. He was a successful commander of armies, and he displayed much genius, but among the world's great captains he cannot be placed in the very first rank. As a statesman he must again take a second place. He was not dashing, nor brilliant, nor original. His greatness consisted for the most part in his lofty motives, in his

extraordinary sound judgment and his unlimited courage when standing for a principle."—Elson's History of the United States.

The above is a fair estimate of Washington as a general and statesman, and it would require a microscopic view of him to discriminate. He was neither better nor worse as statesman or soldier. He was equally proficient in both.

4. Give an account of a dispute between France and the United States during John Adams's administration.

Answer.—France was not pleased with Jay's treaty because her august sanction had not been asked for. Our vessels had long been preyed upon by French cruisers, and when we sent Charles C. Pinckney as our minister to Paris he was shamefully treated, and our government was apprised that no minister would be received unless some redress of grievances had been made. John Marshall and Elbridge Gerry were sent over to aid Pinckney in treating with France, but instead of being received courteously they were waited upon by secret messengers, who were designated as X. Y. and Z. They wanted money, a great deal of it. They didn't get it, and our commissioners came home, and the United States prepared for war. Battles were actually fought at sea. Then the intimidating, browbeating Directory, headed by the wily Tallyrand, was willing to quit, and the storm was over.

5. What were the Nullification acts? How did President Jackson treat them?

Answer.—In November, 1832, a convention of the people of South Carolina declared the tariff law null and void, forbade its execution within the state and threatened secession from the Union if there should be an effort to enforce it. President Jackson swore. Then sent an address, full of fire and vigor, to the people of South Carolina. It was strong, reasonable, gentle and to the point. It read: "The laws of the United States must be executed. Those who told you that you might peaceably resist their execution deceived you. Their object is disunion, and disunion by armed force is treason." Then he swore some more and made preparations to enforce the law.

6. To what political party did each of the following belong: Sumner, Douglas, Tilden, Seward, Chase, Greeley?

Answer.—Sumner was a Republican; Douglas, a Democrat; Tilden, a Democrat; Chase, War Democrat; Greeley, a Republican and Whig.

7. Mention an important event of the Civil war which took place in each of the following cities: Atlanta, New Orleans, Baltimore, Vicksburg, Richmond.

Answer.—The siege of Atlanta, by Sherman, in 1864. Capture of New Orleans, by Farragut, in 1862. Massachusetts troops attacked by Baltimore mob while passing through that city, April 19, 1861. Surrender of Vicksburg to Grant, July 3, 1863. Fall of Richmond, April 3, 1865.

8. What section of the United States was opposed to the War of 1812? Why?

Answer.—The New England states were opposed to the War of 1812. The reason is expressed in the words of certain silversmiths of Ephesus who made shrines to the goddess Diana, "Our craft is being set at naught."

9. Describe the method of electing the President of the United States and name all the Presidents who have been natives of Ohio.

Answer.—On the first Tuesday after the first Monday of November of the year in which a President is to be chosen, the voters of the several states vote for the members of the electoral college of their respective states. On the following second Monday in January the electors of the states meet in their respective capitals and vote for President and Vice-President. The vote is then transmitted to Washington, where the president of the Senate, in the presence of the Senate and House of Representatives, canvasses the vote.

Presidents who were natives of Ohio were Grant, Hayes, Garfield, Benjamin Harrison and McKinley.

10. What is meant by the Civil Service? What has been the attitude of Presidents Cleveland and Roosevelt toward this system?

Answer.—The Civil Service is a system by which officials are appointed through a system of examinations which inquire into the fitness of a candidate.

President Cleveland was a firm adherent of the system, and President Roosevelt may well be placed in the same class.

JULY, 1907.

1. Which was the last English colony founded in America? Give the founder's name, date of founding and purpose of the colony.

Answer.—Georgia, 1733, at Savannah, by George Oglethorpe. The colony was founded primarily to furnish a home for those in England and her American colonies who had been imprisoned for debt. He secured the release of many such persons on condition that they emigrate to America and settle in this new colony.

2. Give the homes of the following Indian tribes: Cherokees, Pequots, Mohawks. What were usually the relations between the Jesuits and the Indians?

Answer.—Originally the Cherokees occupied Florida and Alabama; later the Indian Territory. The Pequots occupied southeastern Connecticut. The Mohawks were one of the Five Nations in central New York. The Indians were usually friendly to the Jesuits because they treated the Indians kindly and made many successful attempts to teach and Christianize the Indians.

3. Name five acts of the British government that hastened the rebellion of the colonies.

Answer.—The passage of the Stamp act, 1765; the Writs of Assistance; the Sugar act of 1864; the Townshend act of 1767; the act requiring Americans to quarter British troops, 1771; the Intolerable acts, 1774.

4. Give an account of the engagements at Saratoga. Who was commander of the colonial troops? Who were the real heroes of the battle?

Answer.—The first battle of Saratoga was fought September 19, 1777, with General Burgoyne commanding the British and General Gates the Americans. This battle was fought at Bemis Heights, near Saratoga, N. Y., and was indicisive. For two weeks after both armies lay in camp, strengthening their fortifications. Benedict Arnold was deprived of his command after the first battle and was fretting under the restraint and the injury. He rushed to meet Burgoyne's army when Burgoyne marched out to meet the Americans. Gates undertook to recall Arnold, but it was too late—the battle was on. Arnold won a vic-

tory while Gates remained in his tent. This was October 7. Burgoyne surrendered to Gates October 17.

5. Summarize the difficulties Washington encountered in undertaking the presidency.

Answer.—(1) To organize a new government under the Constitution. (2) The country was greatly in debt and had no credit abroad. (3) There were many dissatisfied Americans who were more or less British at heart. (4) The work of cementing the states into one federal Union.

6. What was the purpose and effect of the Embargo act of 1807?

Answer.—Jefferson advocated the Embargo act, which was passed in 1807, thinking that to prevent our ships from entering French and British ports with American products would bring those countries to terms and cause England to cease her impressment of American seamen. But it served to hurt American commerce and did more harm than good. During the next year and a half American commerce was almost ruined. The act was repealed March 1, 1809.

7. Give the names of several prominent champions of the cause of slavery and the arguments they advanced to justify secession.

Answer.—The arguments for slavery may be summarized thus: The negro was mentally inferior to the white man, hence could never become equal; the slave was the happiest when some one else provided for him, clothed him and fed him; the negro was incapable of carrying the responsibility of citizenship; the good of the whites in the South demanded slave labor; it was claimed the Scriptures justified slavery. The arguments against slavery: The effect upon the whites was to cultivate a fierce and passionate temper; slavery was a denial to the negro to assert the manhood that was in him; the oft-repeated horrors of slavery were proofs of its tendency to cruelty; it was expensive, wasteful, could not be applied to modern machinery; slavery was contrary to humanitarian principles.

Some of the prominent champions were Jefferson Davis, Stephen A. Douglas, Alexander H. Stephens, John C. Breckenridge, Stonewall Jackson, Robert E. Lee, John C. Calhoun.

8. Name some causes of the financial panic of 1873.

Answer.—(1) Great losses caused by the fires in Chicago in 1871 and Boston in 1872; (2) railroad speculation; (3) the Credit Mobilier affair, 1872.

9. How are presidential electors chosen? What determines the number of electors to which a state is entitled?

Answer.—Presidential electors are chosen by a direct vote of the people. Each state is entitled to one elector for each congressional district and two electors-at-large, or as many as it has Representatives and Senators in Congress.

10. How many amendments have been made to the Constitution since the Civil war? What has been their general purpose?

Answer.—Three—Thirteenth, Fourteenth and Fifteenth. Their general purpose was to grant rights of citizenship and of electors to colored people.

GEOGRAPHY.

Answers by Supt. Fred S. Beard, Genoa, Ohio.

AUGUST, 1906.

1. What determines the width of the zones?

Answer.—The width of the mathematical zones is determined by the amount of inclination of the earth's axis. The axis is inclined 23° 27′ from a perpendicular to the plane of the earth's orbit, called the ecliptic. This inclination marks the distance beyond the poles (polar circles) that will be reached by the oblique rays of the sun on June 21 and December 21, and the distance north and south of the equator reached by the perpendicular rays of the sun on September 22 and March 21.

2. Account for the luxuriant vegetation in the Amazon valley; for the arid condition of Lower California.

Answer.—The luxuriant vegetation in the Amazon valley is due to the warm temperature and abundance and regularity of the moisture. The arid condition of a large portion of Lower California is due to lack of rain.

3. Name one state in the United States and one foreign country noted for the production of each of the following: Salt, copper, cotton, beet sugar, and wool.

Answer.—Salt—Utah, Colorado, Michigan, California, West Virginia, and Ohio; England, Syria. Copper, Michigan, and Australia. Cotton—Texas, and China. Beet sugar—California, and France. Wool—Ohio, and Australia.

4. Define and illustrate: Estuary, pampas, crater.

Answer.—An estuary is a single wide mouth of a river, like the Amazon. Pampas is a grass-covered plain, like the pampas of the La Plata. Crater is the usually cone-shaped opening in the top of a mountain through which the molten rock of the interior is forced out by pressure from within.

5. With regard to the following rivers give source, direction and outlet: Wabash, Orinoco, Ganges, Red River of the North, Rhone.

Answer.—The Wabash forms the boundary between southern Indiana and southern Illinois and empties into the Ohio. The Orinoco rises in Colombia, flows northeast, and empties into the Atlantic ocean. The Ganges rises in the Himalayas, flows southeast and empties into the Bay of Bengal. Red River of the North forms part of the eastern boundary of North Dakota, flows first southward, then westward, and finally northward, and empties into the southern extremity of Lake Winnipeg. The Rhone rises in eastern France, flows south, and empties into the Gulf of Lyons.

6. Locate three centers of the meat packing industry in the United States.

Answer.—Chicago, Omaha, and Kansas City, Mo.

7. Under the control of what government is each of the cities mentioned below: Melbourne, Manila, Hongkong, Paramaribo, Gibraltar?

Answer.—Melbourne, Australia, is under control of England. Manila, Philippine Islands, is under control of the United States. Hongkong, China, is under control of England. Paramaribo, Madagascar, is controlled by France. Gibraltar, in southern Spain, is a fortified city governed by Great Britain.

8. Discuss the relative natural advantages of St. Paul and Pittsburg as commercial centers.

Answer.—Both are exceedingly well situated. St. Paul has very fine water power and a great navigable river whose navigation begins at that place. She is also almost in the center of the great grain field of the Northwest and in the very path of the traffic between Washington, Oregon, the Puget Sound country and the East, and in the path of the growing trade between Manitoba and the Saskachawan country on the north and the Mississippi valley on the south.

Pittsburg, however, is even more favorably situated. The greatest path of trade on the continent passes through Pittsburg from east to west. The Ohio river, whose navigation really begins here, carries the greatest tonnage of any river on this continent. The volume of business done in Pittsburg is the largest of any city of its size in the whole world. It is near the greatest coal fields in the

United States, and the iron ore of the lake region is easily shipped to Pittsburg, where great steel mills are to be found in abundance.

9. Describe the mountain ranges of Spain.

Answer.—Three-fourths of the entire Iberian peninsula is a great plateau averaging about 2,500 feet in height This plateau is broken by numerous ridges. The most southern range is the Sierra Nevada, which is separated from the rest of the plateau by the valley of the Gaudalquiver river. The Cantabrian Mountains, near the northwest coast, and the Pyrenees Mountains, on the boundary between Spain and France, and the Sierra de Guadarrama range north of the center, are the other principal ranges.

10. Name six counties of Ohio and give the county seat of each.

Answer.—Cuyahoga, Cleveland; Hamilton, Cincinnati; Lucas, Toledo; Franklin, Columbus; Montgomery, Dayton; Mahoning, Youngstown.

SEPTEMBER, 1906.

1. How is latitude measured? What points on the earth's surface have the same latitude?

Answer.—Latitude is measured on the meridians and by the parallels. All places on the same parallel have the same latitude.

2. Locate the principal forest regions of North America. What woods do we import from India and the West Indies? For what purposes are these woods used?

Answer.—The United States Bureau of Forestry recognizes five principal regions of tree growth, differing both in the climate and soil conditions required and in the nature and usefulness of the several products. The Appalachian region gives us three distinct forest tracts—the **Northern Pine Belt,** from Minnesota east to the ocean and south to Tennessee; the **Southern Pine Belt,** from northern Maryland southward along the Atlantic and Gulf coasts to the valley of the Rio Grande, and the **Interior Hardwood Forest,** between these two and stretching westward from the Piedmont region to the Great Central valley. The Northern Pine Belt, so called in the United States, pre-

serves some of its characteristics in Canada, where it extends obliquely northwest across Athabaska. In Canada it is called the **Southern Timber Belt.** The **Great Central Plains Region,** possessing no trees except along the beds of streams and on occasional knolls, constitutes a forest region awaiting the certain success of intelligent attempts to solve one of the greatest problems confronting American forestry. The Cordileran region gives us two forest belts—the **Rocky Mountain Forest,** a region of irregular tree growth because of the combined influence of forest fires and semi-aridness, and the **Pacific Coast Forest,** probably the most densely timbered and prolific forest strip in the temperate zones. Canada recognizes these two as one—the **Columbia Timber Belt.** Besides the two before mentioned, Canada has the **Northern Spruce Belt,** skirting Hudson bay and extending westward to Alaska, and the **Forest Belt of the Maritime Provinces,** which possesses characteristics all its own. Almost entire Mexico affords a rich forest growth yielding a great variety of products in timber, medicines, dyes and fruits.

From the West Indies we import rosewood, logwood, cedar, lignum vitae, mahogany and ebony mainly for dyeing and for cabinet purposes. From India come the teak, saul, deodar, blackwood, bamboo, sandal wood, tun, sundari, sissoo, ironwood, catcheu and other timbers valuable chiefly for carpentry and cabinet making, but also for dyestuffs and tanning.

3. Why do so few large rivers flow from our continent into the Pacific ocean?

Answer.—The mountains, being close to the ocean, present a barrier to the rain-laden winds that come in from the ocean and do not permit of long seaward slopes. Besides, at the broadest part of our continent the winds are seaward on the western coast.

4. About how many thousands of miles of railroads are there in the United States at the present time? Trace the railroad route by which you would travel in going from the county seat of the county in which you live either to New York or to Washington, D. C.; to San Francisco.

Answer.—About two hundred thousand. This is really

not so hard when one remembers the big lines. To Washington, Ohio would use the Baltimore & Ohio or the Pennsylvania Lines. To New York, the Pennsylvania Lines or the New York Central Lines. To San Francisco, the Union Pacific or the Santa Fe would be available. Local connections will lead to these trunk lines.

5. Bound Venezuela, describe its drainage system and locate its capital city.

Answer.—Venezuela lies to the north of Brazil and has Colombia on its west and British Guiana on its east. Its north faces the Caribbean sea. Its southern part drains into the Amazon system. The Orinoco system receives many tributaries from the northern slopes. Its capital is situated in the northern part.

6. Why is the climate of a large part of the west coast of Africa unhealthful?

Answer.—Frequent heavy rains, vile gases from decaying vegetation, lack of drainage of the land, stagnant water in the swampy seacoast, numerous swarms of insects, the intense heat and the almost entire absence of shelter contribute to render the west coast of Africa fatal to foreigners.

7. What states occupy the Balkan peninsula? What are the chief industries and products of this peninsula?

Answer.—The Balkan states are Greece, Bulgaria, Turkey, Roumania, Montenegro and Servia. Mining is badly managed and its pursuit restricted. Home manufactures are clothes, carpets, ribbons, hosiery, wines and attar of roses. Grazing abounds. The fields produce various grains, cotton, grapes, currants, olives, figs, nuts, tobacco. From the forests are woods, valonia and nuts. The neighboring waters produce sponges, meerschaum, amber and verdigris.

8. What change has recently taken place in the government of Norway and Sweden?

Answer.—These kingdoms, once united under a single government, with a single legislative body, have recently separated and now each kingdom is independent of the other.

9. Account for the rapid growth of Duluth, Minn.; Guthrie, Okla.

Answer.—Guthrie was founded in 1889 and has grown to a city of 15,000 people because the rapid development of the rich agricultural region demanded a central distributing point for receiving its implements and for shipping its products of grain and cotton.

Duluth, population 3470 in 1880, 33,187 in 1890, 52,699 in 1900, owes its rapid growth to the development of the rich farming region in the Northwest, to the opening of the extensive iron and copper mines in its vicinity and to its location at the head of the commerce of the Great Lakes. Besides, Duluth is splendidly situated for economic administration, possesses a fine natural harbor, an abundance of good water and pure air and adequate means for converting the rapids of the St. Louis river into electric power.

10. What and where is each of the following: Great Bear, Sable, Oakland, Welland, Shasta?

Answer.—Great Bear is a lake in the Mackenzie river system. Sable is a low, sandy island in the Atlantic east of Nova Scotia. Also, a cape extending southwest from Nova Scotia. Also, a cape at the extreme southern end of Florida. Welland canal is on the Canadian side around Niagara falls. Mount Shasta is a mountain peak, famous for its beauty, located in California. It was named for a tribe of Indians whose home was in this vicinity.

OCTOBER, 1906.

1. Give an explanation of ocean currents. Why do they not flow directly north or south?

Answer.—If we remember that water evaporates faster under the greater heat and that the sun's rays are hotter at the equator, we would soon find reasons why the water of the ocean moves from the poles toward the equator. Then, too, this movement would be always due north from near the south pole and due south from near the north pole if the earth were not rotating on its axis. But it does rotate, and just as the water you have seen upon a rapidly rotating grindstone was constantly falling behind the surface of the stone, so the water in the ocean is constantly falling behind in its course towards the equator. Hence, north of the equator the current moves westward of a true

south course; and south of it, westward of a true north course. Besides, since the surface of the earth at the equator is moving through space faster than any other place upon it the tangential force would therefore be greater and would tend to hasten the rate of the water's flowing. Now, we have seen cause of both current and direction; but the shape and position of the continents, islands, contour of the ocean bed, still further deflect the currents into courses due to these local conditions.

2. What are isothermal lines? Why are they not parallel to parallels of latitude?

Answer.—These are lines used by geographers to show the mean annual temperature of places. In their course across a continent they have a generally east and west direction, but frequently deflect northward or southward in obedience to local conditions affecting temperature.

3. What is meant by the center of population? Where was the center of population in the United States at the time of the taking of the last census?

Answer.—The center of population of a country is the center of gravity of the population, each person being considered as having the same weight. In 1900 the center of gravity of our population was six miles southeast of the city of Columbus, Indiana. During 110 years of our nation's history the center of our population has moved steadily westward, averaging a little more than nine-tenths of one degree a decade. Its least advance was in 1890-1900, when developments in manufacturing predominated in our country. Prior to 1830 its westward movement was less than one degree, that being the time of our nation's childhood—when we were clinging to the Atlantic seaboard and mastering the lands lying near at hand. Commencing in 1830, the rich West, the Southwest and the opening of the Pacific industries drew the center of population rapidly westward. Only once till 1890—from 1860 to 1870—was its rapid progress stayed, this time by the Civil war. Oddly enough, the line of western movement of our center of gravity has described no marked curves northward or southward. Its movement has been in a line almost straight along the 39th degree north latitude, being south of that parallel for only

two decades. During the first decade, 1790, it was nearly twenty miles north of this parallel. Thence it has swung steadily southward, till the rapid development of the southern portion of the Louisiana Purchase placed it about two miles north of this parallel, 1840. Again, 1850, the center swung southward of its parallel, about one mile, owing to the influence of Texas, just then being felt.

4. Bound: Massachusetts on the south; Ohio on the east; Argentine Republic on the east; France on the north; Korea on the west.

Answer.—Connecticut and Rhode Island, Pennsylvania, West Virginia; Paraguay, Brazil, Uruguay and Atlantic ocean; English channel, Strait of Dover, Belgium and German Empire; the Chinese Empire.

5. Describe the drainage of Western Africa. Why is a great part of the coast country unhealthy in climate?

Answer.—In the north part of the Atlantic slope of Africa are many rivers whose volume of water varies with the seasons from dry courses, or nearly so, to raging torrents. Most books gives no names, but Roddy's, to this concourse of streams. Coming southward the eastern slopes of the Senegambia region gives rise to two streams of some importance—the Senegal and the Gambia. Of these the Senegal is the larger. Boats may navigate it during the rainy season a distance of perhaps 750 miles; during the dry season one-fourth as far. The winding course of the Gambia affords about 400 miles of navigation during the six months of the year. The interior slope of the same region affords a source to the Joliba, the upper stream of the Niger system. Here are many swamp lakes and large navigable tributaries are found along the Niger's winding path to the ocean. During the Niger's course to the ocean the name of the main stream changes with almost every addition of a tributary. Its broad alluvial delta has an ocean face of 200 miles, through which the main stream is called the Nun. Next southward is the Kongo, which rises far inland and possesses a network of important tributaries not yet fully mapped, but probably making a total length of 3000 miles, with a drainage area of one and one-half millions of square miles. The Kongo has the largest estuary

in the world. The Massamba mountains have two streams of importance, the Kwanza on the eastern slope and the Kunene on the western, affording little navigation. Then comes the Orange river system, draining the slope of the Drakenburg mountains, whose valleys resound with the history of South Africa. Because of the entire absence of drainage the numerous breeding places for myriads of insects and other life of stagnant water, the frequent rains and the lack of sanitation.

6. Mention two large American cities whose growth has been rapid; two whose growth has been slow but steady. Account for the difference in growth.

Answer.—Philadelphia, as a city, has had a steady but constant increase in population and wealth since its settlement. This is due largely to the fact that quite early in the city's history the entire site was built over; hence about the city as a center has grown quite rapidly a remarkable list of suburban villages. Besides, the city is located quite near to the New Jersey line and therefore cannot count that population as a part of Philadelphia. The growth of Indianapolis has been steady and rapid, sometimes a single decade showing a doubled population. This has been due in large measure to the unswerving loyalty of her citizens, which gave an increasing confidence in the industries of the town. This, with the opening and maintenance of the surrounding rich farming land, has made the city. The growth of Boston has been steady and at one time bid fair to rival even New York in its greatness. But the decline of New England farm land and forests, together with the building of the Erie canal, drew commerce from Boston to the latter city. Richmond, Va., though one of the oldest, most historic and most beautiful of American cities, has yet had a remarkably slow growth. Prior to the Civil war the activity of the Southern plantations was distinctly rural; then came severe, devastating war, followed by a period of slow recuperation and development of agricultural and manufacturing resources.

7. Locate five ports having notably fine harbors and name the chief articles of commerce passing through each.

Answer.—Possibly these ports will answer: (1) Duluth,

which sends away the wheat and barley of the rich Northwest and the mined iron and copper ores of the hills behind the city. In return Duluth receives cloths and foodstuffs, manufactured in the East. (2) Portland, Ore., receives much of the rice, manila, sisal and tea from the Orient, and sends to the lands across the Pacific lumber, flour, meats and other products of the farther Northwest. (3) Galveston sends out wheat, corn, cotton and other products of the Gulf slope and receives in turn rich woods from the Antilles, Bahamas and tropical America, dyestuffs, bananas, etc. (4) Port Jackson, as the harbor of Sydney, Australia, is called, sends out coal, the various products of rich pastoral lands, and gold. It receives vast quantities of manufactured goods for the commonwealth of Australia. (5) Hamburg, in Germany, possesses a vast system of quays and wharves that have been the marvel of the civilized world for years. This port imports raw materials, food materials and sends out newly built ships, manufactured tobacco, iron, malt liquors and meats.

8. Discuss the mountain systems of continental Europe.

Answer.—The oldest mountains of Europe are those of the Scandinavian peninsula. But Europe's great mountain mass finds its nucleus in the high and rugged Alps, in the south central part, holding the culminating point, Mont Blanc, 15,781 feet. From this great mountain mass radiate many ranges, though bearing no geological relation to the Alps themselves. To the east extend the Carpathian ranges in a long, semi-circular belt along the Servian frontier. South and southeast from these lie the Balkan ranges and the Perim Dagh and Despoto Dagh, whose rough and rugged passes have echoed Europe's fiercest battles for race supremacy. Extending southward from the Alps are the Apennines, Italy's walls of granite. Near here, but isolated in every particular, are the two famous volcanoes, Etna and Vesuvius. Southwest from the central mass may be found the Pyrenees, showing a curious lot of intersecting ranges that have been the marvel of French geologists for some years. From the Pyrenees southwest lie the Sierra Nevada and other minor ranges of the Pyrenean Peninsula, as Iberia is sometimes called. Directly west

from the Alps are the Civennes, and more northwestward we find the Jura and the Vasges ranges. To the north Germany has the Hartz, the Thuringewald and the Fichtelgebirge, and yet farther to the northeast are the Erzgebirge and the Bohmerwaldgebirge. On the boundary between Europe and Asia, long since merely conventional, is the lowlying Ural range. The Valdai hills form another low, outlying mountain formation in Russia. The southeast of Europe has the Caucasus as a barrier between that continent and Asia. If the Caucasus belong to Europe, then Mount Elbruz, 18,470 feet, is the culminating point of Europe.

9. Mention a foreign city in approximately the same latitude as Columbus, Ohio; Chicago; New Orleans.

Answer.—Columbus, Peking; Chicago, Rome, Moukden; New Orleans, Cairo, Hangchau.

10. Trace the route of a vessel sailing from the Norfolk navy yard, by way of the Philippines, to San Francisco.

Answer.—This vessel would pass out of Norfolk navy yard, through the historic Hampden roads, into the Atlantic; thence by way of the Strait of Gibraltar, Mediterranean sea and Suez canal to the waters of the Gulf of Suez, Red sea and Straits of Bab-el-Mandeb. It is now in the Indian ocean, from which it will pass through the famous Strait of Malacca, South China sea, and make a landing in Cavite harbor. From here to San Francisco by way of Honolulu is a popular route.

NOVEMBER, 1906.

1. Discuss the resources and development of Siberia.

Answer.—Siberia possesses in the main four great regions, all of which are almost or quite unproductive. In the southwest is the great steppe or pastoral region, where the soil is strongly saline and hence barren and unproductive. Yet here are occasional tracts of grassy land, affording a semi-nomadic existence to numerous Cossack tribes. Here is the extensive steppe of Ishim, a barren surface encrusted with salt. To the northeast of Ishim and similar to it is a second tract, the steppe of Baraba. This steppe is surrounded on three sides by a rich agricultural

district greater in size than the British Isles twice over, yet only partly under the plow and yielding but a modicum of its possibility. On the north Baraba merges into a dense forest of vigorous birch, fir and pine scarcely touched by ax or saw and where beaver, bear, wolves, ermine and sable live secure. Here, in the waters of the Obi and Yenesel, are rich fisheries of salmon, herring and sturgeon. Stretching far across the north are the moorland tracts or tundras. Here the land is monotonous, flat and covered with moss. Floods abound. The climate is rigorous, even winter's ice lying but a few inches below summer's thaw. In the fifth region, round Lake Baikal, all the cereal crops of Europe may be grown, good pasture is found, and forests of larch and birch are profitable. The geology of Siberia affords a wealth and diversity of minerals rarely surpassed, which likewise awaits a new wakening to yield their wealth of metalic treasure. Then factories will spring up, and, instead of one long, wavy line of railroad. Siberia will possess a vast system of interesting and active iron and stone highroads of commerce.

2. Locate an extensive arid region of Asia and account for its lack of rainfall.

Answer.—The plateau of Deccan, which is arid, may be taken as an example of a desert due to location of mountain chains. The Ganges valley, for comparison, lies in exactly the same conditions as to winds and latitude as Deccan. But here the low Khasia foothills of the Himalayas catch the moisture-laden monsoon trades and wring from them the greatest rainfall in the world, whereas similar winds pass entirely over Deccan before losing their moisture in the Himalayas far to the northward. Deccan's slopes carry this moisture back to the sea on its western side in the Indies. Hence the Desert of Thar or Indian Desert.

3. With the aid of a diagram explain the change of seasons.

Answer.—Consult Roddy's or Natural Geographies, or Houston's Physical Geography.

4. What constitutes a river system? Into what body of water does each of the following rivers empty: Volga, Euphrates, Jordan, Monongahela and Seine?

Answer.—A main stream with all its lateral streams and tributaries of whatever nature constitute a river system. The Volga empties into the Caspian sea; the Euphrates, with the Tigris, into the Persian gulf; the Jordan into the Dead sea; the Monongahela helps the Allegheny form the Ohio; the Seine flows into the English channel.

5. With regard to the Welland and Kiel canals, tell what bodies of water they connect, by what country each is controlled, and why they are important as waterways.

Answer.—The Welland canal, 27 miles long, on the Canadian side of Niagara falls, was begun in 1824 by private capital, largely from the United States, and completed in wood, being first opened to commerce in 1832. But mistakes and errors prevailed till finally the Dominion government took over the entire affair, substituting stone and steel for the wood, and reopened the canal in 1871. By 1901 the growth of commerce demanded rebuilding and enlargement of the work, till now the 27 miles has 25 of the most approved locks, netting a total water rise of 327 feet, and costing $25,000,000. The canal is open about 240 days in a year and during that time nets in tolls of all kinds $225,000—about $1000 per day.

The Kiel canal, constructed and controlled entirely by the imperial government of Germany, connects the North sea, near the mouth of the Elbe, with Kiel, just a few miles north of the city of Kiel. This canal, begun in 1887 and finished in 1895, is 61 miles in length, with an average depth of thirty feet, lies mainly in a low, marshy tract of land, and hence was constructed at a minimum of excavation and total cost of $40,000,000. Though built primarily for military and naval purposes, the dues collected from the 21,571 merchant vessels, total tonnage 4,282,258, amounted to 2,133,155 marks for the year 1900. Oddly enough, the German people do not call it the "Kiel canal," preferring the name "Kaiser-Wilhelm Ship Canal" instead.

6. Locate the best agricultural, mineral, fruit and oil regions of Ohio.

Answer.—In Ohio the northern and southwest portions are devoted mainly to agriculture; the southeast and southern portions to mining; the lake counties are rich in

orchards and vineyards, while small fruits are grown everywhere; the central northwest and central southeast portions produce much oil.

7. Mention the Great Lakes in the order of their size and give a theory to explain their origin.

Answer.—Beginning with the largest: Superior, Huron, Michigan, Erie, Ontario. The most plausible explanation is that there was a series of depressions which were scooped out to make the large lake basins by the great ice sheet of the Glacial Period.

8. What addition to the number of states was made by the last Congress? How many and what territories are now possessed by the United States?

Answer.—Oklahoma and Indian Territory were united and added to the Union as the State of Oklahoma. Our territories are: New Mexico, Arizona, Hawaii and Alaska, the latter having been created a territory by the last Congress.

9. Mention two cities each, noted for the following industries: The refining of sugar, the smelting of iron, the manufacture of furniture, the packing of pork, the manufacture of boots and shoes.

Answer.—Sugar: New York, New Orleans, San Francisco, Berlin, Breslau, Lisle. Iron: Philadelphia, Pittsburg, Ironton, Columbus, Cleveland, Essen, Glasgow. Furniture: Grand Rapids, Detroit, Indianapolis, Chicago, Sheboygan. Pork: Chicago, Indianapolis, San Francisco, Buffalo, Hamburg, Frankfurt. Boots and Shoes: Brockton and Lynn, Mass.; Portsmouth and Cincinnati, Ohio; London and Liverpool, England.

10. Name some products which are exported from the harbor of Manila, Sitka, Trieste.

Answer.—Three-fifths of Manila's exports is Manila hemp; besides gold and silver, copra, unrefined sugar and molasses, and tobacco are also exported.

From Sitka are sent considerable quantities of gold, wheat and barley; spruce, pine, tamarack and poplar timber; crude oil; furs and fish.

Trieste, the headquarters of the great Austrian Lloyd Steamship line, sends out more emigrants than any other

city in Southern Europe. Its exports are wool and woolen goods, sugar, paper, clothing, surgical and scientific instruments, glass and metal ware.

DECEMBER, 1906.

1. Define commercial geography. How much of the time allotted to geographical instruction would you devote to it?

Answer.—Commercial geography embraces a knowledge of the world's products, including the demands for them and the means of transportation and exchange. Geography is a composite subject, reaching into the very depths of natural science, and demanding all that history and economics have to give. A knowledge of the products of a land and of the relation of these products to the industries of its inhabitants is always desirable in teaching the subject; and finds a proper place in every good text-book, however elementary. And we may add, is frequently explained and enlarged upon by every good teacher. Yet the pupil is not ready for a formal treatise on commercial geography till he is well into the high school, if indeed then.

2. How would you teach to a class of beginners the relations which the earth bears to the other planets?

Answer.—Every school should be equipped with a globe for the teacher's desk, and other smaller globes for the pupils' desks. By means of these the elementary principles of mathematical geography may be taught. Pictures and diagrams should also be frequently employed.

3. Locate three arid regions of the western United States, and tell what means have been employed to render them fertile.

Answer.—The Great American Desert region occupies one-half of the Cordilleran province of North America. It easily divides into two physiographical provinces, (1) the Nevadan, lying to the east of the Sierra Madre Mountains, including most of the Mexican states of Sonora and Sinaloa, and stretching northward into our own New Mexico, Arizona and Utah; and (2) the Chihauhuan region, which covers Southern Mexico, Texas west of the Pecos, and the

Cordilleran Plateau of Mexico. The second of these provinces, besides the semi-arid Cordilleran Plateau, includes the **Llano Estacado,** of the older geographies, and the shifting **Medanos** of El Paso, which rival the sand-dunes of the Sahara. A few of the localities within the Nevada region are (1) **Death Valley,** the most desolate region on earth; (2) the **Mohave Desert,** including Mohave Sink; (3) **Yuma Desert,** rich in mines; (4) **Sandy Desert,** of the Lower Colorado; (5) the semi-desert of **Tonto Basin** in Arizona; (6) the picturesque **Painted Desert** region; (7) the **Black Lava Malpais** of New Mexico; (8) the **"Flour-dust" Desert** of New Mexico and Arizona, so familiar to passengers on the Southern Pacific; (9) the glaring **Crow Flat Desert;** (10) the **Jornado del Muerto,** where whirlwinds create great sand storms, and (11) the **Sequara Desert** of Sonora. Irrigation is rapidly reclaiming this vast region to agriculture.

4. How do German manufactures compare with those of the United States? Of what articles do German manufactures largely consist?

Answer.—German manufactures include cotton and wool fabrics, hosiery, carpets, linen articles, jute, silk; machinery and machine tools; ships of all kinds; glass; leather, gloves, and fur goods; gold, silver, brass, and bronze wares; watches and other time-pieces; toys; apparatus used in experimental and mechanical art; industrial, art, and electrical appliances; chemicals and drugs, soaps, candles, beet-sugar, wines and other liquors, tobacco, and furniture; lithographing and copper plates and their products. A large part of the population are artisans and manufacturers. Hence, Germany buys largely of food stuffs and clothing, and sells extensively of manufactured articles. Formerly the domestic system largely prevailed; now the factory system is rapidly gaining precedence.

5. What city do you consider to be the chief railroad center of Ohio? Why?

Answer.—Cleveland is perhaps the best railroad center of Ohio. This from the importance and number of its lines and from their tonnage. Cincinnati, however, has excellent communication with its 16 lines. Columbus has

18 lines radiating in every direction to the state boundaries and beyond. Toledo, also, claims to be second only to Chicago with 14 direct trunk lines with branches making 27 in all that are available for the city's commerce.

6. Mention ten seaports of South America and opposite each, write the name of the country in which it is situated.

Answer.—Para, Brazil; Bahia, Brazil; Rio de Janeiro, Brazil; Montevideo, Uruguay; Buenos Ayres, Argentina; Valparaiso, Chile; Iquique, Chile; Callao, Peru; Guayaquil, Ecuador; Cartegena, Colombia; Barranquilla, Colombia; La Guaira, Venezuela; Puerto Cabello, Venezuela; Maracaibo, Venezuela.

7. Where are the zones of the trade winds? What climatic conditions usually prevail in these zones?

Answer.—The zones of the trades lie just beyond the Zone of Calms and extend to the parallel 30° north and south of the equator. Here the winds are constant and regular, insuring a steadiness of temperature. They bring little or no rain.

8. Name three French dependencies and one French penal colony.

Answer.—The chief foreign possessions of France include Tunis and parts of West Africa, Madagascar, parts of Indo-China, some of the West Indies, and part of Guiana. (Roddy's Complete Geography.) French Guiana is a penal colony.

9. Discuss the nature and extent of the mineral resources of Belgium; of England.

Answer.—The mineral wealth of Belgium ranks next to agriculture in importance. Extensive mines are worked for manganese, coal, lead, iron, and zinc principally in the four southern provinces. Of the mineral exports, coal ranks first, and iron second. Nearly all the manganese is used at home for bleaching purposes. In addition to the above minerals, Belgium quarries much stone in the slate, flag, lime, and freestone vareties. The beautiful Dinant Black Marble has made Belgium famous throughout the industrial world.

With the exceptions of quicksilver and gold, the mineral wealth of England is very varied and extensive. Mines

are worked for all of the valued metals, including coal and some of the alkaline earths. Clays exist abundantly and afford an extensive enterprise. Quarries are readily found, and many brine pits and rock salt beds have been opened. Admirable building stone is found, while granite and quartz add to the ornamental architecture of England's cities.

10. Explain the cause and manner of United States intervention in Cuba in the fall of 1906.

Answer.—This trouble resulted over a political quarrel from the island elections. The successful "Moderato" party were accused of unfair and arrogant tactics, whereupon the defeated "Liberals" became insurgents and sought to gain control by force of arms. It is not entirely clear that they wanted control of the Cuban government more than annexation to the United States. Open disturbance occurred on the 19th of August, 190 lives were lost, property destroyed or burned, and the island terrorized till in one month the western half of Cuba was in the hands of professional rebels, and Havana was threatened. The executive organization was paralyzed; and, moreover, the men who had brought on this condition could not realize that any wrong had been done. At this time, September, 1906, marines having been landed and subsequently withdrawn, Secretary of War Taft and Mr. Bacon, on the State Department of the United States government, arrived in Havana. Their mission was diplomatic, but as a suggestion of the iron that might be in their velvet gloves an army of 7000 men and a naval fleet larger than the one which destroyed Cervera's squadron was placed at their command. The result was a compromise. The insurgents were disarmed and sent home, keeping the horses they had stolen and holding some of the government positions. The "Moderato" President Palma resigned. Now Cuba has another trial at self government.

JANUARY, 1907.

1. Name the six grand divisions in the order of area; population.

Answer.—Area: Asia, Africa, North America, South America, Australia. Population: Asia, Europe, Africa, North America, South America, Australia.

2. How would you show to pupils that the nature of the coast line of a country influences its civilization?

Answer.—This interesting study may be made by comparing the coast lines and civilizations of several countries. The teacher is chiefly of use here in directing the pupils to proper and helpful reading and in aiding him to discern the real character of the type of civilization studied. Here, as indeed everywhere, the real teacher is a guide.

3. How does the climate of the Pacific coast states differ from that of the Atlantic coast states in the same latitude? Why?

Answer.—The Pacific states are warmer and more equable in temperature than the Atlantic states in the same latitude. Rainfall is more evenly distributed. This is largely because of the closely protecting mountain ranges, the direction of the winds and the gentle eddy of the Japan current along the Pacific coast.

4. Name two plants that yield sugar, two that yield oil and two that yield fibre and state a locality where each grows abundantly.

Answer.—Sugar cane grows in Louisiana and the Gulf States. The sugar beet grows in the central plain wherever the soil will support it. The seed from the cotton, grown in southeastern United States, produces oil. Peanuts, from which large quantities of oil are made, are cultivated in the coastal plain states. Cotton also produces fibre. Hemp, one of Kentucky's products, yields fibre.

5. Trace an all-water route from Singapore to Bahia.

Answer.—I should say that this vessel would go eastward through East Indian and North Australian waters, across the Pacific ocean. From this it would pass through Magellan strait and turn northeastward over the Atlantic to Bahia, in Brazil.

6. Mention one river, one city and one industry of each of the following: Manitoba, Arkansas, Turkey in Asia.

Answer.—Manitoba has the city of Winnipeg and the Assiniboine river; Arkansas, Little Rock and the Arkansas; Asiatic Turkey, Smyrna and the Tigris and Euphrates rivers. These countries are each in agricultural districts.

7. Name two states in the United States whose natural

resources are largely undeveloped, and state the nature of these resources.

Answer.—The agricultural industries of Texas and Arkansas are as yet poorly developed.

8. Name the counties of Ohio, with their county seats. that border on the Ohio river or that border upon Lake Erie.

Answer.—See "Geography of Ohio" in Roddy's Complete Geography.

9. Locate the British possessions in Africa and give two reasons why they are valuable to Great Britain.

Answer.—The British possessions in Africa are Egypt in the northwest, Cape Colony in the south, Nigeria, Gold Coast and Sierra Leone in the west. These possessions are valuable to the "mother country" in furnishing raw materials for her factories and by becoming a market for the manufactured products.

10. What and where is each of the following: Archangel, Aconcagua, Albemarle, Aden, Atlas?

Answer.—Archangel, Russian seaport, on the Dwina near the North sea and capital of a province of the same name.

Aconcagua, an extinct volcanic peak in Chile: a province in central Chile, and a river flowing through it.

Albemarle, a shallow freshwater sound on the coast of South Carolina.

Aden, a British town in Arabia, and the peninsula on which it is situated; also a gulf extending south of Arabia to the Indian ocean.

Atlas, an extensive mountain system in northwestern Africa.

FEBRUARY, 1907.

1. Locate the Tropic of Capricorn; the Arctic Circle. Over what portion of the earth are the sun's rays vertical on June 21?

Answer.—23½° south of the equator. 23½° south of the north pole. Over Tropic of Cancer.

2. Compare and account for the difference in the climate of the east and west coasts of the United States.

Answer.—Some basis may be had for this discussion if we recall that from Virginia north to New England is a

range of 100° F. in mean annual temperature and but 50° F. on the western coast in a corresponding latitude; also, July gives a range of 40° on the east coast and but 20° on the western, from which it easily appears that the west side of the United States is of a more even temperature than the eastern. Moreover, the north Virginia isotherm, latitude 40° N., is the same as that of British Columbia, 50° N., and that of the coast of the Gulf of Mexico, mean temperature 80° F., gives a range of 60° F., or from semi-arctic to semi-tropical, while Southern California, mean temperature 70° F., has a range of but 30° F. Or, to continue the study, let any student compare the climate of Puget sound with that of Labrador, or take the Mexican plateau against the Nicaraguan plains, or balance "California climate" with that of Florida. From Puget sound to Lower California there is no range of temperature. All the isotherms turn sharply northward just west of the Rocky Mountans. This region extends from nearly the parallel of Boston to North Georgia; yet the western shore does not have the harsh changing severity of a New England climate, nor the heavy, moisture-laden atmosphere of the southeast. To the New England conditions first: Here the nor'-easter, it is true, is moisture-laden from the warm Gulf stream; but almost at once it is chilled to precipitation by the ice-bearing Arctic current and the land-dust need only be added to bring down the heavy New England rain or snowfall with its assured fall of temperature. Whereas, in the west such a condition is not possible. The waters of the warm eddy of the Kuro Siwo, or Japan Current, are blended with the colder Behring waters near the cost, sending up a stream of fog that cools slowly as the gentle westerly wind travels over the land. And here is the contrast of southeast with northwest. Along the southeast the Gulf stream is near the coast; the mountains are not. This with the deep indentation of the Gulf of Mexico saves the vast central plain of North America from becoming a desert rivalling the Sahara in extent. Moist air cools slowly, except where there are mountains to wring from it the treasure which it bears. The necessary mountains are present in the west, each successive range taking its toll till the great wall, the

Rockies, turns the entire burden back in numerous rivers as an annual rainfall of from fifty to one hundred inches. In the southeast a similar rainfall is carried far inland and scattered over an area many times larger. The next contrast is that of Southern California, which differs from that of Puget Sound only in its method of ordering the seasons. Here winds similar to those of Puget Sound blow inland: but the soil is too warm to cool them and thus precipitate their moisture. Hence only on the crests and slopes of the low coast ranges is there any "rainy season" except the soft, sharp rainfall that results from the regular fall of temperature during the night. Hence, the entire region to the high mountain wall is wholly desert except as some peak or range, perchance, draws from the atmosphere its toll of moisture. Therefore, that queer concourse of rivers in the Great Basin, giving only one notable drainage system, the Colorado. Moreover, these westerly winds are constant, which fact enables the Rockies to make a climate all their own, unmarred by any influence entering from the plains lying east of the mountains. Here there are fertile "provinces," commonly called "parks," whose environing conditions and internal structure make them garden spots, and next beside these are great rocky deserts able to lock securely whole empires of the Orient; or again, they create vast lake regions which, with their variable network of rivers, effect a local climate unlike any other. Again, these same Rockies bend in their northern part, westward, thus presenting a solid wall to the south-bound winds blowing from the broad expanse of ice-fields that stretch across the Arctic portion of the continent. Whence we have the isotherm of Dawson City the same as that of Lower Hudson Bay and Klondike Creek, and South Greenland, whilst the cold, piercing winds from ice-capped Polar islands pierce deep into the eastern slope, making not a spot as far south as Florida secure from severe frosts, and often giving a temperature varying from north-temperate, or even Arctic, to tropic, within two dozen miles or half so many hours.

3. Bound: Canada on the south; Russia on the west; Brazil on the north.

Answer.--By the United States. By the German Empire,

Austria-Hungary, and Roumania. By Colombia, Venezuela, Guiana, and the Atlantic Ocean.

4. What are isothermal lines? Why are they not parallel?

Answer.—Isothermal lines are employed by geographers to designate places having the same mean annual temperature. Local conditions, such as character of soil, direction and the temperature of winds, continental reliefs, and ocean currents make them crooked. Hence, too, they are not parallel.

5. What is a water-shed? A river basin? An estuary? Give an illustration of each in South America.

Answer.—A **water-shed** is a natural divide between drainage systems. The Andes is the Continental Divide. A **river basin** constitutes all the land drained by a river and its tributaries. The Orinoco basin may be mentioned. A river mouth drained by the encroaching sea is called an **estuary.** The Rio de La Plata is the largest known estuary.

6. With regard to the State of Washington, note: Its elevation, its climate, its railroad connections with the east, its exported products.

Answer.—The climate of the State of Washington is moderate, equable in temperature, and moist. By railway eastward the passenger would have a choice of three lines, the Oregon Short Line, Northern Pacific, and Great Northern, and by easy connection over the border the Canadian Pacific. Washington exports vast quantities of lumber, flour, wheat, pottery products and malt liquors from her own boundaries, and possesses in addition a vast transport trade between the central plains and the Orient. The surface is greatly diversified, presenting heights approaching eleven thousand feet and several rolling and fertile plains.

7. In what ways could you make a comparison of the islands of New Zealand and Madagascar valuable to a geography class?

Answer.—Teachers will differ in this comparison. The pupils will have learned to associate certain qualities of climate, situation, soil, and commerce with latitude, density of population, and advancement in culture. Hence, under

these topics a comparison may be made, leading the class to realize the suitableness of each of these islands for the abode of man and the resistance offered to man's efforts to win a livelihood. The native races may be studied with reference to their portion in the life of each island, and the mingling of these with the European colonists, from which the class may catch the marked contrast between French and English methods of colonization. The recitation may close with a few topics like these—and the answers may well be returned, carefully written out for Rhetorical Day: (1) How the rocks of Madagascar helped the natives. (2) The geysers of New Zealand. (3) How did France induce colonists to go to Madagascar? (4) Effects of missionary work among the Maoris. (5) The noted fossils of Madagascar and what they teach. (6) New Zealand's progress toward civilization. (7) The Traveler's Tree. (8) The new problems solved by New Zealand. (9) Autobiography of a Hova. (10) New Zealand's fossils and their lessons. (11) New Zealand's ferns. (12) Maori Life. (14) How New Zealand helped us fight our war in the Philippines. (15) Madagascar's palms.

8. What political relations now exist between the United States and Hawaii? Philippine Islands? Cuba.

Answer.—Hawaii is a Territory of the United States. The Philippine Islands is one of our insular possessions. Cuba was established as an independent republic in 1902. Since then the United States has frequently given a helping hand in affairs both internal and external.

9. In Ohio, what and where is each of the following: Adena, Maumee, Serpent Mound?

Answer.—Adena, at Chillicothe, the beautiful home of Governor Worthington, is dear to Ohio people because of the splendid hospitality of the governor and his family. Around this mansion clusters much that is good in the movement for Ohio's statehood, her first constitution, and from here the original hills that gave the design for the great seal may be seen. Adena has been taken as the model for the Ohio building at the Jamestown Exposition.

Maumee, a river in the northwest; also a village in Lucas county, on the river.

Serpent Mound, in Adams county, is one of the most interesting works attributed to the Mound Builders.

10. Name three cities on each of the following rivers and state one important fact concerning each: Danube, Mississippi.

Answer.—On the Danube: Vienna, capital of Austria-Hungary. Buda-Pesth, one center of population, yet two towns not wholly federated, is the local capital of Hungary. Belgrade is the newly transformed capital of Servia.

On the Mississippi: New Orleans, the capital of Louisiana, is the second seaport in the United States, being exceeded only by New York. St. Louis is the capital of Missouri and the fourth manufacturing city in the United States. St. Paul is the capital of Minnesota, located at the head of navigation, 2200 miles from the Gulf of Mexico.

MARCH, 1907.

1. Discuss the mountain systems of Europe as to general trend, greatest height and influence upon drainage.

Answer.—Europe is far too small and the predominant mountain system too near the geographical center to admit of rivers possessing the grandeur of those of the western continent, but such as are, present in their mountain locked courses a beauty of scenery not surpassed. Even from the culminating point, Mont Blanc, the icy glaciers wind their way slowly down on every side, and, as the mountains radiate from this point so they hold between their slopes the valleys of radiating rivers. Though Lake Geneva does not feed all the rivers, it becomes very nearly the geographical center of Europe's drainage system. Nowhere is there such a dependence of the one upon the other. If the mountains, as some contend, give us rivers, then, in turn, the rivers look up to the mountains for the means of their subsistence. If, to please others, we say that the rivers have moulded the mountains, they have made their bed secure in the rocky fastnesses. Even the peninsulas follow Europe's general rule. Only in the vast Russian plain do we find a stream left alone to meander its leisurely course to its outlet. Here the fall is slight, and the current sluggish. Elsewhere the rivers are rushed on by the superior mountain slopes that extend far down their narrow valleys.

2. Compare Massachusetts with Ohio as to the nature of its manufactures; California with Spain as to natural products.

Answer.—(1) These are two grand states, the former surpassing in manufactured articles; the latter, from the diversity of her resources and of her people, yields articles of more varied pursuits. Massachusetts ranks first in cotton and woolen goods, having nearly one-half of the spindles and looms of the nation. And this state is first in the making of boots and shoes from leather and quasi materials; in the production of rubber goods, including boots and shoes, and in fine writing papers. Rhode Island alone surpasses Massachusetts in the manufacture of jewelry. Employing five hundred thousand people in thirty-two thousand factories, with nine hundred millions of dollars invested, Massachusetts produces one and one-fourth billions of dollars' worth of manufactured articles. Ohio ranks first among the states in the making of wagons, vehicles, etc., in pottery and clay products, and second in food preparations, in flouring and grist mills, in the roasting and preparation of coffees, spices, etc., and in the production of agricultural implements of iron and steel. Ohio's products conform closely to the needs of the central agricultural section.

(2) There is a remarkable similarity in the products from the mines of these regions. California, however, from the energy and thrift of its people, has by far the greater and more varied output. Both produce antimony, quicksilver, gold, silver and the ores of copper, lead, iron and zinc, and have an abundance of granite, limestone and sandstone. Of the more local products, California produces three-fourths of the borax of the United States, much salt, petroleum and asphaltum. Here, too, are furnished platinum, manganese, magnesite, graphite, fuller's earth, asbestos, mica, turquoise and tourmaline. Spain yields calamine, tin and gypsum and has some of the semi-precious stones. On account of its long occupation Spain now has little timber of importance, though in olden times Rome received large quantities from this colony, and vast fleets have come from these forests. California is surpassed by

but one state in the Union in the value of her standing timber. Both regions produce nuts in abundance, but most of California's nuts are exotic. Semi-tropical fruits abound alike in these places, and again a mark of similarity is struck in the vast acreages of flowers indigenous to each. Both possess varieties of the same animals, such as the eagle, vulture, wolf, bear, martin, lynx, fox, weasel, wildcat, etc., though the members ars becoming quite scarce in each. Of animals of the sea Spain has the tunny, anchovy, sardine and the herring; California possesses the seal and the salmon.

3. Tell all you can about the physical and political geography of the Sudan.

Answer.—The Sudan lies south of the Sahara and west of Abyssinia and the Red sea. On the west this vast region of some two millions of square miles merges into French and German territory, and on the southeast it reaches the Indian ocean through British East Africa. On the south it drains into the Kongo, on the east into the Senegambia and northward through the Nile. It is estimated that fifteen millions of people live here, representing many native states in various stages of culture and political advancement. Eastern Sudan is held by France, southeastern is claimed by Germany, while by far the better and more productive central and western part is occupied by Great Britain. Sudan is a rich region, awaiting occupation of a people that will make a home there.

4. Nevada and Illinois are in practically the same latitude. Account for the difference in fertility.

Answer.—Illinois is located in the rich central plain of the continent, is well drained and possesses an abundant rainfall. Nevada is shut in by mountain ranges, has little rainfall, few rivers, and the surface is largely composed of bared volcanic rocks.

5. Locate seven cities, limiting the names to the following list: Kingston, Springfield, Frankfort, Georgetown.

Answer.—Kingston, in New York, on the Hudson; in Jamaica, the capital; in Canada, at the head of the St. Lawrence. Springfield, in Massachusetts, on the Connecticut; in Illinois, the capital; in Missouri, south of Jefferson City;

in Ohio, county seat of Clarke county. Frankfort, in Kentucky, the capital; in Prussia, on the Odor; in Prussia, on the Main; in Indiana, in the northern part.

6. Give the source and relative length of the following rivers: Mississippi, Volga, Amazon, Kongo.

Answer.—Mississippi Springs, 6½ miles above Lake Itasca and 2553 miles from the Gulf of Mexico. Marshes, near the Valdai hills; 2200 miles. In the Peruvian Andes, not yet explored; estimated at 4000 miles. In the vicinity of Lake Bangweola, not yet explored; estimated at 3000 miles.

7. What is an ocean current? What ocean current flows along the east coast of the United States? The east coast of Japan?

Answer.—A stream of water flowing between the waters of the ocean as banks is called an ocean current. The Gulf stream. The Kuro Siwo, or the Japan Current.

8. With regard to either the province of Manitoba or the province of British Columbia state its chief products, its capital city and one river that flows through it.

Answer.—Manitoba, capital Winnipeg, on the Assiniboine and Red rivers, contains many other small rivers and lakes of the Nelson-Saskatchewan system. The province has little manufacturing. Its many waters afford excellent fishing, and its thick woods offer large game to hunters. Its products are wheat, oats, rye, barley, flax, edible roots and vegetables, apples, potatoes, domestic dairy products and cattle.

British Columbia has the Columbia, the Fraser, the Skeewa, the Liard and the Peace rivers. Its capital is Victoria. The chief products are wheat and other cereals, fruit of many kinds, cattle and sheep and their products, timber and the products of the mill, furs, fish, gold, silver and coal.

9. Explain what effects mountains and rivers may have in determining the occupations of a state or country.

Answer.—By exposing the folded and broken rock strata mountains bring within the reach of man valuable ores. Thus mountains may be said to encourage mining. The slopes are not conducive to agricultural pursuits. Hence, allowed to lie long without disturbance, they invite timber men into the well-grown trees. Nor do they give profitable

adventure to commerce by the rivers that rise in the many springs along their slopes. As the narrow mountain valleys widen to make the broad plains farming becomes more general, and mining, except when erosion has exposed rocks valuable for quarrying, entirely disappears. The far-expanding silt-covered delta plains present new and richer soils, and here agricultural pursuits become the sole occupation of the inhabitants.

10. What is meant by the summer solstice? When does it occur?

Answer.—The summer solstice is the point in the ecliptic at which the vertical rays of the sun cease their northward secession from the equator. This occurs about June 21 each year, at which time the sun's rays fall vertically upon the Tropic of Cancer. The sun is entering the sign of Cancer of the zodiac.

APRIL, 1907.

1. Over what circle on the earth's surface are the rays of the sun vertical on March 22; June 21?

Answer.—Equator. Tropic of Cancer.

2. Name six states, besides Ohio, through which the fortieth parallel passes.

Answer.—The fortieth parallel crosses New Jersey, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Missouri, Colorado, Utah, Nevada, California and forms the boundary between Kansas and Nebraska.

3. On what body of water is each of the following cities located: Bismarck, Vera Cruz, Singapore, Trieste, Seattle?

Answer.—Bismarck, North Dakota, on the Missouri river. Vera Cruz on the Gulf of Champeachy. Singapore on Malacca strait. Trieste on the Gulf of Trieste at the head of the Adriatic sea. Seattle on Puget sound.

4. How is petroleum obtained from the earth and made marketable? Name at least two countries in which it is found.

Answer.—Petroleum is obtained by drilling wells into the earth. From these wells the oil flows or is pumped. It is prepared for use by refining. It is found in Russia and in Austria, besides the United States.

5. Name two cities which, although in the same latitude, have greatly differing climates and account for this difference.

Answer.—San Francisco possesses the soft, mild, equitable climate of the middle Pacific coast. St. Louis is exposed to all the changeableness of a city upon our inland plains. The former has a protected coast climate, the latter an exposed continental climate.

6. Why is England especially suited to be a manufacturing country?

Answer.—England is situated at the geographical center of the commercial world. Hence, the shortest lines of travel will radiate from her harbors, and these islands must be a suitable collecting and distributing point for the world's materials of trade. Besides, ocean freight rates are low. England's supply of coal is ample, and her extent of tillable land quite limited. These are some of the reasons that have led the English people to turn their attention to the work of the factory.

7. Describe and account for the uneven distribution of population in Australia.

Answer.—In the interior of Australia the heat and drought are extreme. Hence the population in this region will be sparse. In the west coast districts there is a fringe of land that has ample rainfall. Here is a narrow belt that is being filled with people. On the western part the fertility of the soil and the healthy climate attract many settlers for agricultural pursuits. And here, too, the wealth of the mines is establishing many mining towns. For these reasons the commercial and manufacturing towns are located here.

8. Mention two important articles of export from Sweden, Uruguay, Iceland, Greece, Siam.

Answer.—Sweden, timber and dairy products; Uruguay, wheat and sheep and cattle products; Iceland, fish and Iceland moss; Greece, currants and figs; Siam, cabinet woods and pottery.

9. Bound Ireland and discuss its manufactures.

Answer.—Ireland is bounded on the south and west by the Atlantic and on the north and east by the North chan-

nel, Irish sea and St. George's channel. In Ireland linen manufacturing has for many years been in the lead and compares favorably with that of any other country. Cotton was once woven, but this industry is rapidly declining. Woolen goods are now woven to some extent, and "Irish tweed" is known the world over. About twenty mills make paper. Brewing porter and distilling whisky are important industries. Ireland excels in hand-made laces and embroideries. The White Star Steamship Line builds its ships at Belfast, and some minor companies have shops and yards at other ports. Ireland abounds in home industries.

10. Describe and account for the peculiarities of the mountain population of Tennessee and Kentucky.

Answer.—Eastern Tennessee and Kentucky are inhabited for the most part by three classes of people. Here came the clans of Scotch Covenanters when they had lost the cause of religious liberty for which they strove at home. And, too, they had lost the political liberty, which all hold so dear. The Welsh, in considerable numbers, have settled here. They have lost their cause of liberty and fought away from their beloved Wales by "taking to the hills." And many English have carried into this region the traditions of olden Saxon times. Is it any wonder that negro slavery never held its full sway among such a liberty loving people? This land affords numerous rich but narrow valleys, not nearly enough to support a thick population. Hence there will be a struggle for possession of the land. Those who know the history and traditions of these races say that each will stubbornly resist intruders and contest its rights with force. The local history of the region under discussion seems to prove the statement, for settled here, where there is little dealing with the great forces of civilization, away from the trunk lines of travel, living largely upon local productions and experiencing the deep freedom of a mountain life, these people set a meager price upon human life, settle all differences by primitive and direct methods and present many perplexing problems in the enforcing of the law and grave difficulties in educational advancement. And yet they are worthy people, keen to

spring to the help of the nation when in need, brave, patriotic, self defiant, clinging with persistency to the laws of personal right and justice. Again, the soil of this region is residual in its fertility. Its productiveness depends upon the underlying rocks. No great river washes its alluvia down in freshets to enrich the fields. Soil of this kind becomes in time only moderately productive. Some of these regions, hence, are becoming less productive. The people, once poor, are becoming poorer, and are held to the soil by a double cause—absence of any way to get out except the mountain path, and a poverty that bids well to increase with time. But, withal, the future brightens. for educational and religious missionaries are going into this region, improved agricultural methods are being introduced, and ere long some line of travel will cut across this country. During the last few years articles upon this subject have appeared in The Outlook, New York, and Mr. Allen's "The Reign of Law" gives a view of the educational and religious situation. The efforts of Berea College toward this people constitute one of the brightest pages in the educational history of the United States.

MAY, 1907.

1. What is the earth's relation to the sun? To the other planets?

Answer.—The earth is a planet and hence revolves around the sun in an eliptical orbit, receiving heat and light from it. The diameter of the sun is 110 times greater than the earth, and its bulk would make 1,300,000 globes like our own, and that is 500 times the volume of all the planets. The earth, in mean distance from the sun, is ninety-two millions of miles, and more than three million miles nearer to the sun in winter than in summer, from which we can gather that the sun, because of its enormous bulk, guides the earth in its orbit, gives it speed and is the fountainhead of all life on it. Among the planets the earth is one of the major group, possesses an average orbital velocity of 1110 miles per minute and a period of revolution of 365 days, nearly. The earth further possesses the characteristics of the four inferior planets in that it has a

solid centrosphere, with a less dense hydrosphere and atmosphere on the outside. It is a highly compressed solid body, ranking fourth in orbital distance from the sun.

2. In beginning geography, how would you give the children first ideas of distance and direction?

Answer.—This may well be taught from the standpoint of "Home Geography." Teach the pupil to know the distance between well-known objects; from these call attention to objects farther away—towns, stations, cities, etc. Direction and the cardinal points may be taught by having the pupil stand and point east, north, west, south and to the semi-cardinal points.

3. Why do the largest rivers of Ohio run in a southerly direction?

Answer.—Ohio's longest slope is southward. Besides, the southern portion of the state is hilly, and the hard, impervious strata lie close to the surface. A very great part of the rainfall runs off as surface water. In the northern part the slopes are gentle, and the rainfall goes down as ground water.

4. Name the most southern point of land of South America, Asia and Africa; the most northern point of land of Europe and Australia.

Answer.—South America, Cape Horn. Asia, Cape Romania. Africa, Cape Agulhas. Europe, North Cape. Australia, Cape York.

5. Write of the termini and ownership of the following railroads: Trans-Siberian, Canadian Pacific.

Answer.—The western termini of the Trans-Siberian Railway are at St. Petersburg and Moscow; its eastern, Vladivostok. The Japanese control that part of the system south of Mukden, with a terminal at Port Arthur. This railway is owned by Russia except that part captured by Japan during the recent war. The Canadian Pacific is owned by a syndicate of English capitalists. Its western terminus is Vancouver, on the Pacific. It receives eastern shipping at several points, notably Halifax, Sydney and Quebec.

6. What are the essential features of a good harbor? Name three United States seaports that have good harbors.

Answer.—Good harbors possess the following qualities:

A broad, deep entrance channel, adequate for all kinds of vessels in all kinds of weather; a simple and easy anchorage, free from rocks and shallows, having a good holding ground and protected from winds, waves and the effects of the tides. In addition, commercial harbors should have adequate construction for the handling and care of merchandise and for loading and discharging the vessels. Portland, Ore., San Francisco, New York and Boston have good harbors.

7. What and where are three of the following: Westminster Abbey, the Hall of Fame, Mammoth cave, Simplon tunnel?

Answer.—Westminster Abbey is one of the finest specimens of architectural art in Great Britain. Here kings and queens are crowned, and when their lifework is done Westminster receives them again to their last resting place. The Hall of Fame, in the University of New York, is a memorial to famous Americans. It is to contain 150 tablets of America's most successful men. Mammoth cave, in Kentucky, is an extended series of caverns notable for their extent and for their beauty. The Simplon tunnel is a passage for railway trains through the Alps. It is regarded as one of the most important works of engineering skill in the world.

8. By whom was the project of a canal across Panama originally undertaken?

Answer.—Authorities differ. The project had been held dear to the lives of many men prior to the beginning of the nineteenth century. Various countries were interested in an all water route between the two oceans. The first actual work was done by the French company under the engineering leadership of Ferdinand de Lesseps.

9. Name an island in Lake Erie; in the Irish sea; in the English channel; in the Black sea; in the Gulf of St. Lawrence.

Answer.—Kelly's Island, in Lake Erie; Isle of Man, in Irish sea; Channel Island, in English channel; Anticosta island, in the Gulf of St. Lawrence. The maps give no island for the Black sea.

10. What are the political divisions of Central America?

Answer.—Guatemala, Belize, Salvador, Honduras, Nicaragua, Costa Rica and Panama. Belize is British, and the United States holds a zone along the route of the Panama canal in Panama.

JUNE, 1907.

1. Approximately, how many square miles of land and water are there upon the earth's surface?

Answer.—Of water, 142,000,000; of land, 55,000,000 square miles.

2. Name the thirteen original states and give the present capital of each.

Answer.—Consult any present-day geography.

3. Tell of the location, nature and extent of the work of the United States government in reclaiming arid lands.

Answer.—Prior to 1902 irrigation in the United States was desultory and local; only in a few states, as in California, was the enterprise encouraged sufficiently to warrant active operations. But the National Irrigation act of 1902 provided that the general government, under the control of the Department of the Interior, should foster the construction of irrigation systems, in conformance in each instance to the laws of the state and to local conditions. Under this act it is hoped that most of the arid land in the sixteen states thus affected will be added to their productive areas. And this irrigated land will be most desirable in supplying the demands of the newly developing trans-Pacific trade. Some of the plans recently completed or building are the Wasatch tunnel, in Utah; the Salt River dam, in Arizona; the Grand River canal, in Colorado; the Bear River reservoir, in Idaho; the Sanpete County system, in Utah, and the Trukee dam, in Nevada. Other plans are in course of construction. United States Department of Agriculture Bulletins Nos. 130 and 133 are free to all interested.

4. Name two shipping centers of Brazil. What products pass in and out? Name two manufacturing centers of France. What articles are made?

Answer.—Of Brazil, Rio de Janeiro is the largest city and capital. Back of the city lie rich lands, in which attention is given to the raising of coffee, sugar cane, millet, manioc,

cotton, rice, cocoanuts and live stock, such as cattle and hogs. Formerly these products were shipped unprepared for domestic use to other countries in Europe and America. Now factories are being rapidly established, and in a few years only the prepared goods will be sent away. Besides the above, this port ships great quantities of native woods useful for cabinet and ornamental purposes, and many plants, herbs, etc., valuable for the rich gums, resins, drugs, chemicals, etc., which they furnish. A rich bed of kaolin promises soon to become important for the wares in fine porcelain it will furnish. Its imports are agricultural implements, tools, staple lumber, furniture, manufactured clothing and food. Para is the greatest rubber port in the world. It handles the products of the Amazon valley. Besides rubber, this port ships cacao, vanilla, sarsaparilla, coffee, sugar, hides and Brazil nuts. Para's port is called Braganca. This port receives prepared food and clothing for the up-river inhabitants of Brazil.

In France, Lyons is the center of the silk industry, and Limoges porcelain is known the world over.

5. Give a brief account of Belgium's political experiences in Africa.

Answer.—When, in 1879, Stanley had proved the identity of the Kongo river, a "Committee for the Study of the Kongo Region" was formed under the auspices of King Leopold II, which sent Stanley back into this new region to attempt to develop its resources. It was during this second expedition that Stanley and his followers founded most of the towns bearing European names in the Kongo valley. Events progressed favorably till 1884, when the Congress of Berlin established the colony of Kongo Free State, opened all its waters to the free trade and navigation of the world, provided for the suppression of the slave trade, named King Leopold II of Belgium as governor and made Brussels the seat of the Kongo colonial government. Five years later Leopold bequeathed his rights to the Belgian people, who thus came into possession of a rapidly developing region. In 1890 the newly organized territories of the Kongo State were declared inalienable, and the right of annexation was reserved to Belgium at the end of ten

years. But Great Britain protested against the plan, whereupon Belgium, realizing the popular opposition of the Kongo tribes, decided to abandon the plan of annexation and to encourage a purely commercial colony. During about thirty years of active interest in the Kongo region, Belgium has succeeded in organizing a native army of about 17,000 men, mostly officered by Europeans, and in locating about 2000 of her citizens in the new region. And yet, although the Belgians have organized the political and civil government, British merchants receive the greater part of the trade and profit most by the natural resources of this vast region.

6. Name the physical factors that have influenced the nature and extent of the settlement of Arizona; British Columbia.

Answer.—In Arizona is the remarkable irrigation plan known as the Salt River Storage dam. This dam is 210 feet high, and besides the large local area which it supplies with water for irrigation it has a system of electrical fittings by which power is generated by hydraulics and conducted to distant points, where it is used in pumping ground water for further irrigation purposes. This will multiply the present cultivated area by forty. Besides this vast arid land area, Arizona has a vast tract of alkali land that can be utilized with difficulty. Most of the forest growth has been reserved. Sandy plains constitute a part of the arid region. In the north the elevated plateau region yields rich returns for mining wherever sufficient water can be obtained. In general, lack of rainfall is the chief hindrance to Arizona's development.

In British Columbia the rainfall is in the main sufficient and the climate such that the development has been rapid. Numerous small lakes and streams have greatly aided transportation, and a dense forest growth has added to the material resources of the colony. The mines are readily operated, and an abundance of fuel is always at hand. However, the steep and rugged mountain walls have made some resistance to the construction of numerous railroads.

7. What is meant by the relief of a country? Compare the relief of Holland with that of Switzerland.

Answer.—Relief refers to the surface elevation of a country. Holland is low and flat, rarely broken by an elevation of any kind. Swamps abound. If possible, Switzerland exhibits the other extreme in surface aspect. This land is extremely broken and elevated, numerous small valleys prevail, and the mountains often hold small lakes locked between their vast chains. Holland's average elevation is 37 feet; Switzerland is the highest part of Europe.

8. Explain the terms metropolitan and cosmopolitan as applied to cities. Why is New York metropolitan? Why is Cairo, Egypt, cosmopolitan?

Answer.—Formerly the term "metropolitan (from Greek. meter, mother; polis, city, and an, pertaining to—pertaining to the mother city) applied to important cities only in which a chief or ranking bishop was located, but more lately it has become the fashion to call the chief or ranking city metropolitan. Thus, New York merits the title from its wealth, population, business, shipping and commerce. Moreover, powerful influences from these activities are felt in every business and social enterprise. On the other hand, Cairo receives from the world (Greek, cosmos, world) every variety of influence. Hense its type is cosmopolitan.

9. Name a railroad that connects Chicago with Cleveland and mention two cities along its route; a railroad that connects Cleveland with Cincinnati and mention two cities along its route.

Answer.—The Lake Shore & Michigan Southern (L. S. & M. S. R. R.), passing through Toledo and Sandusky, and the New York, Chicago & St. Louis (Nickel Plate), passing through Fort Wayne and Fostoria, connect Chicago and Cleveland. The Cleveland, Cincinnati, Chicago & St. Louis (Big Four) passes through Delaware, Columbus and Springfield between Cleveland and Cincinnati.

10. Give facts to show that a high state of civilization prevails in New Zealand.

Answer.—The vast innovation in New Zealand's government lies in the entire absence of any politico-social class that holds itself responsible to advance radical movements in other countries. From the earliest history of the col-

onies the natives were sought in kindness, and the very few instances of cruelty and harsh treatment of either English or Maoris by the other is an evidence of proper colonization. To the earliest English emigrants the Maoris proved themselves a brave and high-minded foe. The English found it more practicable to strive to elevate the condition of the natives than to suppress and eradicate them. The organization of the state has been along plans proposed by organized labor, and advanced position has been taken in regard to land ownership, taxation and the adjustment of labor-capital controversies. We give here only a partial list of the innovations now encouraged by the civil laws of New Zealand: Equal privileges of citizenship of Maoris and English, complete woman suffrage, old age pensions, entire absence of saloons, with compulsory consideration every three years of further temperance questions; public construction and ownership of public utilities, post-office savings banks, appointment to positions in civil service for life, with provision for support in old age and disability; a government life insurance, the loaning of money on farm lands by the state on mortgage, a civil office for the adjustment and settlement of estates, a progressive scale of taxation, by which almost the entire burden falls upon large holdings, a plan to induce the division of large estates, and the compulsory arbitration of all labor disputes before a board having power to fix the minimum wage. Those interested may consult Parson, "The Story of New Zealand;" Lloyd, "Newest England;" Gisborne, "Colony of New Zealand;" Bradshaw, "New Zealand of To-day;" Loughman, "New Zealand," or Reeves, "State Experiments in Australia and New Zealand." The United States Department of Commerce and Labor has several valuable publications on New Zealand laws and social and political conditions. Those who would care to correlate the study of geography with that of anthropology and political history will find that many of New Zealand's experiments in government and social affairs were suggested to the English by the native Maoris; that those responsible for their incorporation into the body politic were closely associated with the Maori people and that from the idea thus

received the larger system was worked out by the strong English mind in a country completely suited for their reception and operation, and from New Zealand they are now slowly but surely in a somewhat adapted form making their way to most other countries.

JULY, 1907.

1. What is the starting point for measuring longitude? In what time do the sun's vertical rays pass over one degree of longitude?

Answer.—Longitude is measured from the meridian of the Royal Naval Observatory, at Greenwich, England. In four minutes.

2. Why is the climate of Montana colder than that of the state of Washington?

Answer.—Montana lies nearer the crest of the Rockies, slopes eastward, is farther inland and much more exposed to the changes of the central plains, especially to the north winds. Washington borders on the ocean, has prevailing westerly winds, the influence of the warm Japanese current, is protected by the Rockies on the north and has no "northers." Hence, Montana is the cooler state and the more changeful.

3. What towns are located at the proposed extremities of the Panama canal? Of what advantage will this canal be to commerce?

Answer.—At the Pacific end is Panama; at the Atlantic, Colon. For a long time the Isthmus of Panama has been a barrier to the trade of civilized nations. It lies across many important trade routes and hence increases the length of the voyages of ocean-going vessels. With the completion of the Panama canal western South America will be nearer to New York than London, and Sidney, N. S. W., almost as near. Hence, the advantages to the trade of our merchants will be great, and rapid development of South America may be expected. It has long been recognized that London's great advantage has been her position at the center of the commercial world. The Panama canal will create a new center, at New York, that will have, besides the ocean advantages, a superior location on

the richest continent on the globe, controlled practically by a uniformity of laws and customs. Another marked advantage will come to the central Mississippi valley and Gulf states. This region will come directly in touch with the civilization of the south temperate zone in South America. The wants of this zone will create a market for the products of this region. St. Louis will then be as well known in Argentine and Chile as London and Bremen now are, and the development of our textile interests and machine manufactories will be advanced.

4. How many and what drainage basins has Ohio?

Answer.—Ohio has two drainage basins, the St. Lawrence in the north and the Mississippi in the south.

5. Name ten of the world's navigable rivers (not in America) and compare the commerce of one of them with that of the Mississippi river.

Answer.—In Europe, the Rhine, Thames, Elbe, Danube and Rhone; in Africa, the Nile, Zambezi, Kongo, Orange; in Asia, the Yangtse, Hoang, Yalu and Pasig. Possibly the Thames presents the greatest contrast to the Mississippi. This river has no tributaries, is slow of current and opens to the ocean by a wide, unobstructed estuary. Both freight and passenger boats are here loaded for ocean voyages to distant lands. The Mississippi possesses many tributaries, which collect her commerce from afar. The river compels frequent loading and unloading of its vessels and on account of the greatly obstructed delta mouth does not permit ocean vessels to come far inland. One of the strangest facts is the importance of St. Louis as a port of entry. Both the Thames and the Mississippi carry millions of dollars of commerce and thousands of passengers.

6. Trace the route of a United States warship from St. Petersburg, Russia, to the United States navy yard at Norfolk.

Answer.—This vessel would clear the harbor of St. Petersburg by the Gulf of Finland; thence the Baltic sea, the sound, Kattegat, to the North sea; thence, probably, southward through the Strait of Dover and English channel to the Atlantic ocean, from which it would enter the yards of Norfolk through the historic Hampden roads. Germany has

consistently declined to allow war vessels to use the Kaiser Wilhelm canal.

7. Compare the method of English government in Canada with that of English government in India.

Answer.—Canada is divided both historically and politically into provinces and territories, which bear a relation to the general government analogous to our states and territories respectively. These are further divided into counties, towns and townships, which present the same confusion of terms so commonly met in the United States. The school unit is the district. Each province has its governmental organization, which has complete control of the affairs of its own province. The Canadian Parliament exists by the will of Canada's own people, but under an enactment of the Parliament of the United Kingdom. Theoretically an act of the colonial Parliament may be changed or vetoed, but an authority once granted, the United Kingdom would not dare to revoke. Appeal may be taken from Canadian courts to the Privy Council of the Kingdom, but delay has been found to be a powerful check for unreasonable demands. Canada cannot enter into a treaty, make war or peace and does not control her own copyright laws, yet on the whole exercises greater freedom in her affairs than does Ohio in her relations with the federal government. The United Kingdom protects Canada with the imperial navy, expends vast sums for forts and arsenals, yet there are no British soldiers in Canada. The tendency in Canadian politics today seems to be toward complete independence, but within the empire. To this end Canadians resent being styled colonists with those of the east. India is a type of these eastern colonies of the Kingdom. The taxes are for India alone. The secretary of state for India resides in London. This officer is required to countersign all orders for the colony under the king's manual of signs. The local executive government is located at Calcutta. Its authority is vested in a governor-general, with the rank of viceroy. The governor-general has a cabinet of five ordinary and one extraordinary members. The commander-in-chief is the extraordinary member, and to him is entrusted all power of maintaining law and order. India is divided

into districts, each with an officer who is directly responsible for the trade and good will of the natives. All is subordinate to the government at Calcutta, which in turn dares not offend the ministry at London.

8. State facts of geographical interest concerning Singapore, Havre, Bremen, El Paso and Oporto.

Answer.—Singapore is near the largest tin smelting works in the world, is a valuable coaling station for ocean vessels and possesses an increasing commerce with the Straits Settlements.

Havre is the greatest port of France, has direct lines of boats with our southern cities, from which it receives cotton. It manufactures much wine and cotton goods, which are exported to the colonies in Africa.

Bremen is Germany's second port, is located on the Weser, from whose valley it collects large quantities of manufactured and agricultural products for the markets of the world.

El Paso, in Texas, is the only city of importance in the western part of the state, a railroad center and shipping point.

Oporto is Portugal's vineyard city and leads the world in the manufacture of port wine, named from the city.

9. Compare the western highlands of the United States with the eastern highlands.

Answer.—The western highlands are more extended, higher and more rugged than those in the eastern part. They stand in striking contrast with those of the east in the deep serration of their sides, the sharp, angular peaks, and in mountain-locked transverse valleys. Hence, they are said to exhibit a type of "new formation," while those in the east are well rounded, have longitudinal valleys, well worn by the rivers and well developed by the progress of weathering. These are designated as "old formations."

10. Name and locate a city famous for the manufacture of each of the following: Paper, lace, toys, shoes and silk.

Answer.—For paper, Bangor, Maine; for lace, Glasgow, Scotland; for toys, Vienna, Austria; for shoes, Lynn, Massachusetts; for silk, Marseilles, France.

PHYSIOLOGY.

Answers by Supt. Bert Highlands, Berlin Heights, Ohio.

AUGUST, 1906.

1. How would you teach the composition of the bones?

Answer.—By showing the necessity for the mineral matter for firmness and rigidity and of the animal matter for resiliency and elasticity; also by burning a bone or testing a burned bone for its weight and brittleness.

2. Give the physical properties of blood. What changes take place when blood coagulates?

Answer.—Color, red; constituency, thicker than water; weight, heavier than water. When blood coagulates it thickens and becomes jelly-like.

3. State the function of the pericardium, the pleura and the salivary glands.

Answer.—The pericardium is the outside lining of the heart and protects that organ in its constant motion in the thorax. The pleura is the outside lining or covering of the lungs and protects the lungs in their movements in breathing. The salivary glands secrete into the mouth the saliva necessary in digestion and as an aid in deglutition.

4. Discuss the relative nutritive value of beef, pork and lamb; of tea, chocolate and coffee.

Answer.—Beef is the most nutritious, lamb next, and pork least. There is but little nutrition in tea, chocolate, or coffee, but chocolate has the most.

5. Give the function of each of the following in connection with the nervous system: Cerebellum, pia mater, trigeminal nerves.

Answer.—The cerebellum controls the vital organs of the body. The pia mater is a delicate membrane lining the brain and the spinal cord, and as the name indicates, is the "soft mother," or protector. The trigeminal nerves are the three pair of spinal nerves that supply the muscles

of the eyes, the jaws, and parts of the mouth—also called the tri-facial nerve.

6. What are the organs of speech? Upon what does the pitch of the voice depend?

Answer.—The organs of speech are the larynx, vocal cords, nasal passages, tongue, teeth, and lips. The pitch of the voice depends upon the tension of the vocal cords.

7. Describe the structure of the voluntary muscles.

Answer.—Voluntary muscles differ from involuntary muscles in their structure. The involuntary muscles are plain and composed of spindle-shaped cells. The cell substance presents a longitudinal but no transverse striation. The voluntary muscle, such as the biceps, is striated transversely, and is composed of fibers one-five-hundredth of an inch in diameter and over an inch in length. Each fiber has a transparent, elastic sheath called the sarcolemma.

8. What is the effect of alcohol upon muscular tissue?

Answer.—The presence of alcohol in the blood will show itself by its action upon the muscles in extracting the water from them, thus interfering with their normal functions.

9. Discuss the relative value of cotton and woolen clothing as protection against heat and cold

Answer.—Cotton clothing does not check the out-flow of bodily heat as much as woolen clothing, hence, cotton clothing is best suited to summer and woolen to winter.

10. When professional assistance is not at hand, what is the best course to pursue in cases of fainting; drowning?

Answer.—In fainting, a dash of cold water in the face, or the application of cold cloths to the face, neck, and temples, will tend to re-establish normal breathing and a return to consciousness. In drowning, the patient should be laid upon his back, with the head lower than the middle of the back, as lying across a barrel or across the body of another person. The arms should then be worked in a rotary fashion to expand and contract the chest so as to re-establish the breathing process.

SEPTEMBER, 1906.

1. Mention three sources of impurities found in the air. What are some tests of bad air?

Answer.—(1) Expired air; decaying vegetables and other filth in cellars; defective gas and sewer pipes, and refuse about the back doors.

(2) The most common test is the odor; feeble burning of a candle; color.

2. Draw a cross section of the heart, indicating its cavities, valves and the blood vessels entering and leaving it.

Answer.—See any good text.

3. Name the constituents of air exhaled in respiration. Which are poisonous? Where, in the circulation, are these impurities gathered up?

Answer.—Expired air contains about sixteen parts by volume of oxygen, seventy-nine parts nitrogen and argon, and four parts carbon dioxide. There is besides, a considerable quantity of watery vapor, and a variable amount of volatile organic matter, not sufficient generally for chemical analysis to detect, but often perceived in a close room by the sense of smell.—Macy. None are poisonous except that they dilute the oxygen. No certain place in the body can be given. They are formed in any part.

4. Why are muscles arranged in pairs? Define the following terms: Unstriated, involuntary, tendon.

Answer.—Muscles are nearly all arranged in pairs, each with its antagonist, so that, as they contract and expand alternately,the bone to which they are attached is moved to and fro.

Unstriated muscles are those not composed of fibers and hence not striped.

Involuntary muscles are those not under control of the will power.

Tendon is a band or layer of dense fibrous tissue at the end of a muscle, attaching it to a bone.

5. Distinguish between sensor and motor nerves; spinal and cranial nerves.

Answer.—Those which carry the orders of the mind to the different organs are called motor nerves; while those which bring back impressions which they receive are styled **sensory nerves.**

Spinal nerves, of which there are thirty-one pairs, issue from the spinal cord through apertures provided for them in the backbone. Cranial nerves, twelve in number, spring from the lower part of the brain and the medulla oblongata.

6. What advantage is obtained by having the socket of the shoulder joint shallow? Draw a figure and explain what kind of lever is represented when we raise the body on the toes.

Answer.—The socket of the shoulder joint is shallow to give greater freedom of movement. The arm may be removed in almost any direction.

The lever is second class. See any good text for illustration.

7. Name five fluids concerned in the digestion of food. Explain the importance of the portal vein.

Answer.—(1) Saliva; gastric juice; bile; pancreatic juice; intestinal juice. (2) Albumen is changed immediately after entering the circulation. The portal vein carries it directly to the liver to be thus changed.

8. Describe the location and use of the small bones of the ear.

Answer.—The bones of the ear, the malleus, incus and stapes, form a chain across the middle ear from one membrane to the other and convey impression from the outer ear to the inner ear.

9. Make a list of the common diseases of which there is danger of transmission in the school room.

Answer.—Consumption, diphtheria, mumps, scarlet fever.

10. What is the effect of alcohol upon the stomach? Is there such a thing as a true stimulant? Why, or why not?

Answer.—Alcohol irritates the mucous membrane of the stomach. Then more gastric juice is produced in order to dilute the irritating alcohol. Habitual use of alcohol permanently dilates the blood vessels; thickens and hardens the membranes; in some cases, ulcerates the surface; and finally, so weakens the assimilation that the proper supply of food cannot be appropriated.—Steele.

Alcohol is not a true stimulant since its after effect is always depressing.

OCTOBER, 1906.

1. Explain the difference between bone and cartilage. How do broken bones heal?

Answer.—(a) Cartilage in structure is the same as bone except that bone contains more lime. Cartilage is soft while bone is hard. (b) When a bone is broken, the blood at once oozes out of the fractured ends. This soon gives place to a watery fluid, which in a fortnight thickens to a gristly substance, strong enough to hold them in place. Bone matter is then slowly deposited, which in five or six weeks will unite the broken parts.

2. Beginning with the lungs trace the circulation of the blood through the body.

Answer.—From the lungs through the pulmonary veins to the left auricle, thence through the mitral valves to the left ventricle; then past left semilunar valve to the aorta and then through the arteries to all parts of the body; then through the capillaries into the veins, and back to the heart; next through the right auricle and tricuspid valve to the right ventricle, then through the pulmonary artery to the capillaries of the lungs.

3. State the value of nitrogenous food to the body and mention at least three articles of food from which nitrogen may be obtained.

Answer.—As nitrogen is a prominent constituent of the tissues of the body, food which contains it is therefore necessary to their growth and repair. The most common forms are whites of eggs, which are nearly pure albumen; casein, the chief constituent of cheese; lean meat; and gluten. Bodies having a great deal of nitrogen readily oxidize. Hence the peculiar character of the quick-changing, force-exciting muscle.—(Steele.)

4. Explain fully the process of the absorption of food into the system.

Answer.—Absorption is performed in two ways, by the veins, and the lacteals. (1) The veins in the stomach immediately begin to take up the water, salt, grape sugar, and other substances that need no special preparation. The starch and albuminous bodies are also absorbed as they are properly digested, and this process continues

along the whole length of the alimentary canal. In the small intestine, there is a multitude of tiny projections (villi) from the folds of the mucous membrane, more than seven thousand to the square inch, giving it a soft, velvety look. These little rootlets, reaching out into the milky fluid, drink into their minute blood vessels the nutritious part of every sort of food. (2) The lacteals, a set of vessels starting in the villi side by side with the veins, absorb the principal part of the fat. They convey the chyle through the lymphatics and the thoracic duct to the veins, and so within the sweep of the circulation.—(Steele.)

5. Make a complete classification of the teeth (permanent set) as to number, name and position in the mouth.

Answer.—Counting from the middle the first two on each side are called the incisors. The third tooth is the canine. The next two are bicuspids. The next three are the molar. In all, thirty-two.

6. State the function of each of the following: Sebaceous glands, seventh pair of cranial nerves, tricuspid valve, eustachian tube, and cells.

Answer.—Sebaceous glands secrete oil. Seventh pair of cranial nerves are the facial, distributed over face to give it expression. Tricuspid valve closes the opening between the right ventricle and the right auricle. Eustachian tube leads from the middle ear to the pharynx to equalize air pressure. Cilia strain the dust out of the air in the bronchial tubes.

7. How are rays of light brought to a focus in the eye? What constitutes nearsightedness? Farsightedness?

Answer.—(a) The crystalline lens brings the rays of light to a focus on the retina.

(b) If the lens be too convex it will bring the rays of light to a focus before they reach the retina. This is nearsightedness.

(c) If too flat they will reach the retina before coming to a focus. This is farsightedness.

8. How does alcohol interfere with digestion?

Answer.—Alcohol produces changes in food in direct proportion to its strength and amount. If strong and large enough in amount to saturate the food, then it may

coagulate the albumin. It may prevent the pepsin of the stomach from acting. It irritates the mucous membrane of the mouth and causes too great a flow of fluids. It causes increased peristalsis and thus tires the stomach. Extra work of digestion falls on the intestine and digestion is imperfectly done.

9. Why does a fowl flap its wings and jump about after its head has been cut off?

Answer.—The fowl is intent on escaping and the impulse to make such motions has already been sent along the nerves. Any excitation of the nerves, such as cutting off the fowl's head, increases this impulse. No brain center remains to change the impulse. Reflex action on touching the ground also may cause the same effect.

10. What is the distinction between mucous and serous membrane?

Answer.—Mucous membrane lines cavities open to the outside, as, alimentary canal. Serous membrane lines cavities closed to the outside, as, blood vessels.

NOVEMBER, 1906.

1. Define organic matter; inorganic matter.

Answer.—Substances which are built up by living beings are called organic. Inorganic matter is substance not built up of living organs.

2. Name and illustrate in the body three classes of movable joints.

Answer.—The movements of the head illustrate the lever of the first class. When we raise the body on tiptoe we have an instance of the second class. An illustration of the third class is found in lifting the hand from the elbow. For illustration, see any good text.

3. Distinguish among the following: Serum, plasma, lymph.

Answer.—Serum is the straw-colored liquid which separates from a blood clot. Plasma is the liquid part of the blood in distinction from the cells which float in it. Lymph is the plasma and white corpuscles which have left the capillaries to nourish the cells of the body.

4. Describe the structure of the skin and name five functions which it performs in the body.

Answer.—(1) Two distinct layers are found in the skin, called the epidermis, or cuticle, and the dermis or true skin. The epidermis is composed of epithelial tissue, or epithelium, and its cells lie in layers one above another, the outer or horny layer of cells being flat, dry, and unnucleated, or dead. The epidermis contains no blood vessels, but in the deepest layers are found minute terminations of some of the nerve fibers and the fine granules called pigment.

(2) The five functions are (a) protection, (b) excretion, (c) forms complexion, (d) serves to locate ends of nerves, (e) secretion.

5. Name the three divisions of the ear and describe each.

Answer.—The outer, middle, and inner ear. The external ear is a sheet of cartilage curiously folded for catching sound and a tube about an inch long leading to the middle ear. The middle ear is a cavity, at the bottom of which is the eustachian tube leading to the mouth. Across this chamber hang three bones, the malleus, the incus, and the stapes. The internal ear or labyrinth is hollowed out of solid bone. In front is the vestibule about the size of a grain of wheat. From this open three semicular canals and the winding stair of the cochlia. In this is located the ends of the auditory nerve.

6. What and where is each of the following: Pylorus, pepsin, dura mater?

Answer.—Pylorus is the opening from the stomach into the intestines. Pepsin is a ferment found in the gastric juice. Dura mater is the tough, fibrous membrane surrounding the brain and spinal cord and lining the cavities of the skull and spinal column.

7. State how the muscles are attached to the bones, and the advantages of this method of attachment.

Answer.—The ends of the muscles are generally attached to the bone by strong, flexible but inelastic tendons. By this method more muscles may be attached to a joint, the small insensible tendon can better bear the exposure of passing over a joint and be more easily lodged in some protecting groove, and it gives the limbs strength and elegance of form.

8. Describe an experiment to illustrate the effect of alcohol upon albuminous substances.

Answer.—If the white of an egg be dropped into a glass containing alcohol the egg will quickly be congulated and turn white. Alcohol hardens albumen, takes away the coloring matter and shrivels whatever it touches.

9. Why should cold water be used in making soup and hot water in boiling meat?

Answer.—If meat be placed in boiling water the albumen on the outside is coagulated, which prevents the escape of the nutritious juices. On the contrary, if placed in cold water and heated the juices escape to the water. Hence, in making soup the meat should be placed in cold water that the juices may escape into the water, and in boiling meat it should be placed in hot water to keep the juices in the meat.

10. Explain the physiological advantages of sleep. How many hours of sleep are needed by an adult?

Answer.—Sleep is as essential as food. During the day the process of tearing down goes on; during the night the work of building up should make good the loss. It is by means of sleep that the nerve cells regain their form and their readiness to react on receiving stimuli. The number of hours required for sleep must be decided by each person. In general an adult needs from seven to eight hours of sleep in every twenty-four.

DECEMBER, 1906.

1. Describe a cross section of the femur.

Answer.—A cross section of the femur shows the bone to be hollow, covered with a tough membrane, called the periosteum, while the hollow is filled with marrow, rich in fat and full of blood vessels. The solid portion of the bone contains little cavities called lacunae, from which radiate tiny tubes. These surround haversian canals.

2. Give an account of the arterial circulation.

Answer.—The arterial circulation starts from the left ventricle by the aorta, which, after giving off branches to the head, sweeps back of the chest with a bold curve and runs downward, dividing into branches, which penetrate every nook and corner of the body.

3. Name three organs that serve as scavengers and tell how they carry off the waste material from the body.

Answer.—The three organs are the lungs, the skin and the kidneys. The lungs carry off carbon-dioxide and other gases with the expired air; the skin carries off uric acid with the perspiration, and the kidneys carry off urea and other nitrogenous waste along with a large amount of water.

4. What should be the function of all food? Classify foods according to the nourishing properties they furnish to the body.

Answer.—(1) Food should furnish weight, heat and energy to the body.

(2) The question is indefinite. The following classification is a good one:

FOOD.

1^1 Organic.
  1^2 Nitrogenous.
    1^3 Proteids.
      1^4 Gluten of cereals, peas, potatoes.
      2^4 Albumin in white of egg, milk and blood.
      3^4 Globulin from yolk of egg.
      4^4 Myosin in lean meat.
      5^4 Casein in milk and cheese.
      6^4 Fibrin in clotted blood.
  2^2 Non-nitrogenous.
    1^3 Carbohydrates.
      1^4 Starch of cereals, vegetables.
      2^4 Sugars—grape, cane, malt and milk.
      3^4 Cellulose of fruits, etc.
    2^3 Fats.
      1^4 Butter, milk, cheese, meat and oil.
2^1 Inorganic.
  1^2 Water.
  2^2 Salts.
3^1 Food accessories.
  1^2 Drinks—Coffee, tea, cocoa, etc.
  2^2 Condiments—Mustard, ginger, pepper, spices, etc.

5. Contrast the action of alcohol and water in the body

Answer.—Alcohol hardens tissues, water softens. Alcohol

hinders digestion, water aids. Alcohol destroys life of cells, water is necessary to life. Alcohol hardens food, water softens. Alcohol causes thirst, water slakes. Alcohol irritates mucous membrane, water soothes.

6. Explain how the brain and spinal cord are protected.

Answer.—The brain is contained in the upper part of the skull and solidly protected by the curved bones. It is covered with a delicate network of fibers called the piamater. Outside the piamater is a tough membrane called the duramater. The spinal cord occupies the cavity of the backbone. It is protected by the same membranes as the brain.

7. In the eye, state the function of each of the following: Choroid coat; crystaline lens; iris.

Answer.—The choroid coat is a black lining which absorbs the superfluous light. The crystaline lens converges the rays of light which enter the eye and brings them to a focus on the retina.

The iris is a ring of involuntary muscular tissue forming a part of the choroid. It regulates the amount of light entering the eye and gives color to the eye.

8. Why is warm food easier to digest than cold food?

Answer.—Warm water dissolves soluble substances more easily than cold on account of the physical property of expansion by heat. Hence warm food is more easily dissolved. Cold food chills the flow of digestive fluids and lessens the amount secreted.

9. What is the nominal temperature of the body? What sort of clothing affords the body the best protection in winter?

Answer.—(1) 98.2° F. (2) Woolen.

10. What effect has alcohol upon the brain?

Answer.—First, there is a stage of stimulation; second, the cells act in an uncertain manner. This is the stage of disturbed action. Third, the cells act slowly or even cease to act. This is the stage of paralysis. Alcohol weakens the cells, clouds the judgment, clouds the motor regions, lessens sensation. It also may harden and thicken the brain matter, causing fatty degeneration.

JANUARY, 1907.

1. Give the composition of the blood and state as far as you are able the functions of its different constituents.

Answer.—The blood is composed of plasma and red and white corpuscles. Plasma consists of ninety parts water, to give fluidity to the blood; eight parts albumin, which is the food element of the blood, and two parts mineral matter, which is mostly soda and potash. This alkaline property of the fluid plasma aids it in dissolving carbonic acid gas and in carrying it to the lungs. Some of the mineral matter of the blood enters into the composition of the cells of the body, especially of bone cells. The albumin is the substance out of which all of the cells of the body are mainly built. The red corpuscles are composed mainly of hemoglobin, containing a small amount of iron, which gives it the property of carrying oxygen without itself being oxidized.

The white corpuscles prevent foreign substances from entering the circulation and heal wounds.

2. Name the different kinds of joints in the body and give an instance of each. How are the joints protected?

Answer.—(a) Joints are of two kinds, flexible and inflexible. Of the flexible there are: Ball and socket, example, the shoulder or hip; hinge, example, elbow; compound, example, wrist; pivot, example, union of the skull and spine. Of the inflexible there are the sutures of the head. (b) The broad, thin ligaments surrounding a joint form a closed sac. This sac is lined with the synovial membrane, which secretes a fluid whose purpose is to lubricate the joint.

3. What is the thoracic duct? The portal vein?

Answer.—The thoracic duct is the tube running upward upon the backbone and conveying lymph to the left subclavian vein.

The portal vein is the vein extending from the stomach and intestine to the liver.

4. Explain three ways in which the skin gives off heat.

Answer.—(1) The skin gives off perspiration, which, evaporating, cools the skin. (2) The capillaries lie close to the surface, and much heat is given off by radiation.

(3) The skin loses some heat by conduction to the clothing, etc.

5. Name two ferments of the gastric juice and show the value of each in the process of digestion.

Answer.—Rennin and pepsin. Rennin is that element in gastric juice which causes milk to curdle. Pepsin is the ferment which is able to change proteids into soluble form and to make diffusible such as are not already so. There is also some hydrochloric acid to assist their action.

6.. Describe the sympathetic nervous system.

Answer.—The sympathetic nervous system consists of small bodies like grains of corn or smaller, called ganglia, from which nerves go out in all directions. There are four main pairs of ganglia in the head and twenty-three in a row down the front of the backbone, all connected by nerves. Each ganglion is a collection of nerve cells and fibers bound together by connective tissue. Nerve threads connect its cells with the cells of the spinal cord and also with the muscle cells of the arteries and intestine. Through the arteries they probably affect all the cells in the body. The system connects all parts of the body in sympathy and controls the circulation of the blood and the digestion of food. Strong impressions produce a feeling of pain, hunger, thirst or fatigue.

7. Give the number, names and function in circulation of the valves of the heart.

Answer.—There are four valves in the heart. The mitral or bicuspid valves, composed of two curtains, prevent blood returning to the left auricle from the right ventricle. The semi-lunar valves, one in the aorta and one in the pulmonary artery, prevent blood returning to the ventricles from the arteries.

8. What is the effect of tobacco upon the throat? Of alcohol upon the blood?

Answer.—(a) Tobacco is irritating to the throat, causing a cough and rendering it more liable to inflammation. The mucous membrane of the larynx is inflamed and the voice is impaired by smoking. A disease known as "smokers' sore throat" may result.

(b) The strong affinity of alcohol for oxygen causes it

to appropriate the oxygen of the red corpuscles of the blood. This tends to impoverish the blood. Alcohol also takes up the water of the blood.

9. State your method of ventilating a stove-heated schoolroom.

Answer.—All that is needed is to raise two or more windows at the bottom and place a board in the opening so the air may come in between the two sashes. This may be done on the side toward the wind, and one window lowered from the top a few inches on the opposite side.

10. What is the difference between a contagious disease and an infectious disease? Name an effective disinfectant.

Answer.—(a) Contagious disease is one which can be transmitted through the air.

Infectious disease is one which has for its cause some matter which can multiply and grow when introduced into the body of a healthy man.

(b) Carbolic acid, added to from twenty to one hundred times its weight of water, is very effective.

FEBRUARY, 1907.

1. Explain the difference between the structure of the bones in youth and in old age. Name the bones of the skull.

Answer.—(1) The composition of the bones at maturity is about one part animal to two parts mineral matter. The proportion varies with the age. In youth it is nearly half and half, while in old age the mineral is greatly in excess. In many situations parts which are in early life composed of cartilage become afterward replaced by bone through the process of ossification. The final structure of bone is fibrous.

(2) Bones of the skull are: Cranium, one frontal, two parietals, two temporal, occipital, one ethmoid, one sphenoid. Face, two superior maxillary, one inferior maxillary, two malar, two lachrymal, two turbinated, two nasal, one vomer, two palate.

2. Explain physiologically the statement: "The body is the only machine that oils itself."

Answer.—The ends of the bones are covered with a thin

membrane, the synovial, which secretes a viscid fluid, not unlike the white of an egg. This lubricates the joints and prevents the noise and wear of friction.

3. What is the function of the red corpuscles of the blood? What office do the veins perform in circulation? How do they differ in structure from the arteries?

Answer.—(1) It is the important function of the red corpuscles to take in oxygen from the air which reaches the blood in the lungs and carry it to the other tissues of the body. (2) Veins carry the blood to the heart. (3) Their walls are thinner than those of the arteries and collapse when the veins are empty. They contain less elastic and muscular tissues than arteries. Veins are supplied with many semi-lunar valves.

4. Of what organ is the pancreatic juice a secretion and what office does it perform in the digestion of food? Upon what classes of foods does the gastric juice have no effect?

Answer.—(1) Pancreatic juice is a secretion of the pancreas. It is a liquid, 5 per cent. of which is made of three ferments—trypsin, which changes albumen to peptone; amplopsin, which changes starch and sugar to glucose, and steapsin, which saponifies some of the fat. Pancreatic juice performs the main part of digestion. (2) Gastric juice has no effect on carbohydrates (starches and sugars), fats and salts.

5. Liken the nervous system to that of a telegraph. How do the systems differ?

Answer.—The brain may be considered the central office, the nerves are the wires, and the nerve ends are the stations for sending and receiving messages. The nervous system works automatically. Messages are only sent in one direction on the nerves; the sensations differ and the impressions differ, and there is no unbroken connection in the nervous system.

6. Give the structure of the retina of the eye. How are the rays of light brought to a focus upon it?

Answer.—(1) The retina is composed essentially of the end fibers of the optic nerve and nerve cells, making in all ten layers. It is about one-eightieth of an inch in thickness. The rods and cones seem the most important layer

and form about one-fourth of its thickness. Delicate nerve fibers pass from the ends of the rods and cones, each expanding into a granular body, thence weaving a mesh and again expanding into granules. Last is a layer of fine nerve fibers and gray cells like the gray matter of the brain, whence filiments extend into the fibers of the optic nerve. (2) The crystalline lens converges the rays of light which enter the eye and brings them to a focus on the retina.

7. Define each of the following: Tympanum, coccyx, cornea, saliva, piamater and pleura.

Answer.—Tympanum is the middle ear. Coccyx is the end of the vertical column beyond the sacrum. Cornea is the transparent part of the coat of the eye which covers the iris and pupil. Saliva is the watery fluid in the mouth. Piamater is the delicate vascular membrane immediately covering the brain and spinal cord. Pleura is the serous membrane which covers the lungs and lines the cavity of the thorax.

8. Why will tobacco increase a tendency toward consumption? What is the effect of alcohol on the digestion?

Answer.—(1) Tobacco smoke is drawn into the lungs, irritating the throat, causing a cough and rendering the lungs more liable to inflammation. Healthy lungs ward off consumption, but lungs weakened by tobacco are unable to drive out the bacillus, and consumption results more readily from breathing the germs.

(2) Alcohol hardens the food, prevents pepsin from acting, takes water from the cells of the digestive organs, weakens the gastric juice, irritates the mucous membrane, weakens peristalsis, forces the intestine to overwork by preventing the stomach from doing its part, and so weakens all the digestive organs that much of the food eaten is not digested.

MARCH, 1907.

1. What advantage is derived from the contractility of muscles? Why are muscles arranged in pairs opposite each other?

Answer.—(1) The contractility of the muscles is utilized to move the bones and thus the body. (2) The muscles

are nearly all arranged in pairs, each with its antagonist, so that as they contract and expand alternately the bone to which they are attached is moved to and fro.

2. What is approximately the normal temperature of the body? How is an even temperature maintained in the body?

Answer.—(1) The temperature of the body is 98.2° F. (2) The temperature of the body is regulated by means of the pores of the skin and the mucous membrane in the air passages. When the system becomes too warm, the blood vessels on the surface expand, the blood fills them, the fluid exudes into the perspiratory glands, pours out upon the exterior and by evaporation cools the body. When the temperature of the body is too low, the vessels contract, less blood goes to the surface, the perspiration decreases and the loss of heat by evaporation diminishes.

3. Why are arteries elastic? How do you distinguish between venous and arterial blood?

Answer.—(1) Arteries are composed of elastic tissue, which yields at every throb of the heart and then slowly contracts again, keeping up the motion of the blood until the next systole. (2) Arterial blood is bright red, venous blood is dark red. Bleeding of arterial blood is in jets; of venous it is in a steady stream.

4. Distinguish between the function of motor and sensor nerves. What part of the nervous system is the seat of reflex action?

Answer.—(1) Motor nerves carry orders for action from the nerve cells to the cells of the body. Sensor nerves carry influences only from the cells of the body to the central nerve cells. (2) It is thought that the seat of reflex action is in the spinal cord. Sensations reach certain cells in the posterior horn of gray matter in the cord and thence are transmitted by communicating fibers across to the anterior horn from which a motor impulse is sent.

5. Locate in order from the mouth: Duodenum, epiglottis, pylorus, pancreas, rectum. What have the pancreas and duodenum to do in the work of the body?

Answer.—(1) Epiglottis, pylorus, duodenum, pancreas, rectum. (2) The first ten inches of intestine from the

stomach is called the duodenum, and into it are poured the bile and pancreatic juices for the digestion of fats and the foods not already digested. The pancreas secretes thin, watery fluid called the pancreatic juice.

6. Name three coats of the eye.

Answer.—Choroid, sclerotic, retina.

7. What kind of a lever is used when the forearm is raised by bending the elbow joint? Explain.

Answer.—Third class. The hand is the weight, the elbow the fulcrum, and the power is applied by the biceps muscle at its attachment to the radius. In this form of lever there is loss of force but gain of velocity.

8. In bones, what is the function of each of the following: Periosteum, marrow, Haversian canals?

Answer.—The periosteum carries arteries and nerves, which enter minute openings in the bone. Bone stripped of its periosteum is apt to die, but when the bone dies the periosteum usually remains alive and soon reproduces new bone. The periosteum also affords an attachment for muscles. [Overton.] Marrow is of two kinds—yellow and red. Yellow marrow is rich in fat and full of blood vessels. It nourishes the bone. The red marrow produces red corpuscles. Haversian canals are tunnels in the bones for the passage of arteries, veins and nerves.

9. Why is alcohol a thirst producer?

Answer.—Alcohol, by its affinity for water, takes water from the tissues and thus produces thirst.

10. What are sedatives? Why should they be used as seldom as possible, even in illness?

Answer.—Sedatives are drugs which allay or diminish pain or any irritation. Their use is attended with great danger from the fact that it tends to become a habit, and, the habit once acquired, clings tenaciously. Sedatives should never be used except under direction of a competent physician. An overdose causes death.

APRIL, 1907.

1. State the difference between the veins and arteries as to (a) walls, (b) valves, (c) course of the blood.

Answer.—(a) The walls of arteries consist of a muscular layer covered with tough connective tissue and lined with

smooth plate-like cells. The walls of veins are composed of the same material, but are much thinner.

(b) The only valves in the arteries are the semi-lunar at the heart. The veins have valves at intervals to prevent the backward flow of the blood.

(c) In the arteries the blood flows from the heart and in jets as it is pumped by the heart. In the veins the blood flows toward the heart and in a steady stream.

2. Name and describe the outer and inner layers of the skin.

Answer.—Two distinct layers are found in the skin, called the epidermis or cuticle, and the dermis, corimer or true skin. The epidermis is composed of epithelial tissue, or epithelium, and its cells lie in layers one above another, the outer ones being flat, dry and dead. It has no blood vessels, but in the deeper layers is found the pigment. The dermis is a close network of connective tissue fibers, forming a dense, tough, firm envelope for the body, gradually passing into the alveolar tissue beneath. It contains nerves, blood vessels, lymphatic vessels and great numbers of sweat glands and oil glands.

3. Name the different kinds of teeth in the permanent set.

Answer.—Counting from the middle of the front of each jaw, we have two incisors, one canine, two bicuspids, three molars.

4. Give the location of the atlas, femur and sternum and state their functions in the skeleton.

Answer.—The atlas or first vertebra is located at the top of the backbone and supports the skull, being articulated with two shallow hollows, with corresponding projections on the occipital bone. The sternum, or breast-bone, supports the forward ends of the ribs by means of the costal cartilages.

The femur is the thighbone of the leg. It articulates with the innominatum and supports the whole weight of the body.

5. Describe the ribs as to number, attachment and use.

Answer.—There are twelve pairs of ribs, each attached solidly to a vertebra; seven attached by costal cartilages

to the sternum, three attached by costal cartilages each to the preceding, and two have their front ends unattached. They give shape to the chest and serve for the attachment of muscles.

6. What purpose do starchy foods serve in the body? Name five articles of food that contain starch in abundance.

Answer.—(a) Starch is changed to sugar before it becomes a part of the body of man, and sugar is oxidized to produce heat almost as fast as it enters. (b) Grain, beans, peas, potatoes and nuts contain starch in an abundance in about the order named.

7. Draw a line to represent the curve of the spinal column.

Answer.—See any good text.

8. How is the brain protected?

Answer.—The brain reposes securely on a water bed surrounded by a double membrane, the arachnoid, delicate as a spider's web. Within this is a fine tissue, piamater, and around the whole is wrapped a touch membrane, dura mater, which lines the skull. The brain lies within the bony cavity of the skull which rests upon the backbone, and is thus securely protected.

9. When should cold water baths not be taken? What is the effect of hot water baths on the circulation?

Answer.—(a) Cold water baths should not be taken when copious perspiration has continued for an hour or more, nor when the body is much fatigued, nor when the person is too weak to stand the sudden chill. (b) Hot water baths dilate the blood tubes of the skin so that the blood accumulates upon the surface.

10. Is alcohol to be recommended as a fat producer? Why, or why not?

Answer.—Alcohol should not be recommended. Even if it does produce fat it is an unhealthy condition and is not desirable. The main argument against its use is the tendency to alcoholism, for, if alcohol were used in a sufficient amount to produce any moderate degree of fat, it would be almost sure to cause the patient to become a drunkard.

MAY, 1907.

1. Explain how oxidation takes place, and what are its results in the body?

Answer.—"The oxygen that is breathed into the body slowly burns food and the cells, just as it oxidizes the wood under the boiler of an engine. The process goes on so slowly that no flame is produced, but the same amount of heat is produced as though the same substances were burned in a furnace. Oxidation goes on in each cell, but especially in the cells of the lungs and liver. By the oxidation within the cells of the body carbonic acid gas, water and ashes are formed."—Overton.

2. What is secretion? Name all secretions concerned in the digestion.

Answer.—(a) Secretion is the process of separating from the blood some essential important fluid. This fluid is also called a secretion. (b) Saliva,, gastric juice, bile, pancreative juice and intestinal juices.

3. How is the peristaltic movement of the stomach caused? What is its effect?

Answer.—The stomach has three sets of involuntary muscular fibers. The outer set runs lengthwise from the cardial orifice to the pylorus. The middle set encirles all parts of the stomach, while the inner set consists of oblique fibers. Anything taken into the stomach causes a cantinuous and regular movement of the organ due to the alternate contraction and relaxation of its muscular fibers. The food is thus caused to flow in a steady stream from the esophagus to the left and then down to the right and back again, completing the circuit of the stomach in about three minutes.

4. Expectoration in public places is to be condemned as a disgusting habit. Upon what other grounds is it condemnable?

Answer.—The habit is condemned largely because of its liability to spread disease germs, especially consumption.

5. Locate the atlas. Why is it so called?

Answer.—The atlas is the upper bone of the spinal column, so called because as the god Atlas is fabled to have supported the world on his shoulders, so in the body this bone bears the head.

6. Tell all you can of the nature and number of the perspiratory glands. What is the value of perspiration to the body?

Answer.—(a) The perspiratory glands are fine tubes about one three-hundredth of an inch in diameter and a quarter of an inch in length, which run through the cutis and then coil up in little balls. They are found in all parts of the body in almost incredible numbers. In the palm of the hand there are about two thousand eight hundred in a square inch. On the back of the neck and trunk, where they are fewest, there are yet four hundred to the square inch. The total number on the body of an adult is estimated at about two and one-half million.—Steele.

(b) Perspiration enables the body to be cooled when too warm and helps to remove waste products from the body. If perspiration were stopped for but a few hours, death would ensue from poisoning.

7. Define the following: Plasma, diastole, pulse.

Answer.—Plasma is the liquid part of the blood distinguished from the corpuscles. It is composed of water, albumin and minerals. Diastole is the relaxation of the heart so that it may be filled for another beat. Pulse is the wave which may be felt in an artery with each heart beat.

8. What does the eustachian tube connect?

Answer.—The eustachian tube leads from the middle ear to the pharynx.

9. What are the principal constituents of tobacco? What effect, if any, does tobacco have upon heart action?

Answer.—(a) The analysis of tobacco varies greatly by different authorities. The prominent constituents are carbonic oxide, carbon, carbonic acid, ammonia and nicotine. Nicotine decomposes into pyridine, picoline, etc. (b) Tobacco works its most serious wrongs on the heart. Its destructive effect is to depress and paralyze. This applies especially to the young. The nicotine of tobacco acts on the nerves that control the heart action. The motions of the heart become irregular, now feeble and fluttering, now thumping with apparently much force. There is often severe pain in the heart, with dizziness, palor and faint-

ing. It is stated that one in every four tobacco users suffers from "tobacco heart."

10. What are stimulants? Name some. Why should they be avoided?

Answer.—(a) Substances which excite the cells to action without giving them material out of which to develop heat and energy are stimulants. (b) Tea, coffee, alcohol in small quantities. (c) When they are used continually the body learns to rely upon their stimulation. Thus a habit of drinking them is formed which is not easily broken.

JUNE, 1907.

1. Describe a ball and socket joint and give two examples in the body.

Answer.—The ball and socket joints in the shoulder and the hip have the end of one bone fitted into the hollow of another, which provides for motion in any direction.

2. Locate the jugular vein, the tricuspid valve and the pulmonary artery.

Answer.—The jugular vein is the large vein of the neck. There are two branches. external and internal. The tricuspid valve is on the right side of the heart, between the right auricle and right ventricle. It consists of three folds, which fall over the opening and close it. The pulmonary artery arises from the right ventricle of the heart and divides into two branches, one for the right lung, the other for the left.

3. How far is air expelled from the lungs?

Answer.—The walls of the chest being movable, by the contractions of the intercostals and other muscles the ribs are raised and the breastbone pushed forward. The chest cavity is thus enlarged from side to side and from behind forward, and air rushes in to fill the cavity. As soon as the contractions cease the elastic lung tissue resumes its original position. As a result the original size of the chest cavity is restored and the inhaled air is driven from the lungs. Expiration may then be regarded as the result of an elastic recoil and not of active muscular contractions.

4. As to the salivary glands, state location, function, nature and amount of secretion.

Answer.—There are on each side of the mouth three salivary glands, which secrete the saliva from the blood. The parotid is situated on the side of the face in front of the ear. The submaxillary gland is placed below and to the inner side of the lower jaw, and the sub-lingual is on the floor of the mouth, between the tongue and the gums. Each gland opens into the mouth by a little duct. These glands somewhat resemble a bunch of grapes with a tube for a stalk. The saliva secreted by these glands is a colorless liquid without taste or smell. It is alkaline, and its principal element, besides water, is a ferment called ptyalin, which has the property of being able to change starch into a form of cane sugar, known as maltose. From one to two pints are produced daily.

5. Name several foods rich in albumen. What digestive juice acts chiefly upon albumen?

Answer.—(a) White of egg, lean meat, serum of blood, milk. (b) Gastric juice, by means of its pepsin, changes albumen to peptone. The trypsin of the pancreatic juice has nearly the same action.

6. What is the effect of exercise upon the circulation of the blood? What are the best times for schoolroom exercise?

Answer.—(a) Exercise increases the flow of blood through the small vessels of the skin and thus increases the radiation of heat from the surface. It aids the free circulation of the blood and its purification. It enlivens a sluggish circulation and strengthens the heart. (b) Children in school usually get plenty of exercise at play hours. The best time is in the morning. Our present recess system distributes the times admirably. Exercise should not be taken soon after a full meal. In the schoolroom the teacher may give the pupils some simple exercise when they appear restless or tired from study. Often regular periods are assigned for such exercise.

7. How is the eye protected from dust? The ear from insects? The nose from dust?

Answer.—The eye is protected from dust by the eyelids and eyelashes. The ear from insects by the presence of cerumen or ear wax. The nose from dust by the cilia or hair-like processes in the nose.

8. What is the normal temperature of the body? Give one way in which it is regulated.

Answer.—The normal temperature is 98.2° F. The great regulator of the bodily temperature is undoubtedly the skin. When the body tends to become too warm, more blood rushes to the capillaries of the skin, more water is poured upon the surface, which, by evaporation, cools the skin, and the blood thus cooled cools the whole body. When the body tends to become too cold, the blood ceases to come to the surface in such quantities, and the oxidation of food products within the body raises the temperature. Other things assist in regulation of the temperature, viz., lungs, kind of food, exercise and clothing.

9. When may a cold water bath be taken? When should it not be taken? Why?

Answer.—The best and most convenient time for a cold bath is in the morning, immediately after rising. A daily cold bath when the body is comfortably warm is a safe tonic for almost all persons during the summer months and tends especially to restore the appetite. Cold baths taken regularly render the bather less liable to "take cold" and to be disturbed by sudden changes of temperature. Bathing in cold water should not be indulged in after severe exercise or great fatigue, whether one is heated or not. Serious results have ensued from cold baths when the body is in a state of exhaustion or profuse perspiration. Persons suffering from heart disease or from chronic diseases of any important organ should not indulge in frequent cold baths. After a cold bath the body should be rubbed till the skin glows with warmth.

10. What danger lies in the moderate use of alcoholic drinks?

Answer.—The danger in the moderate use of alcohol is very great. The effect is the same as in excessive use except that the results are slower to appear. For this reason the drinker thinks the drink has no effect on him or does not notice the effect. Moderate use almost always creates a greater appetite, which requires a larger quantity to satisfy it and thus leads to excessive use. The only safe rule is total abstinence.

JULY, 1907.

1. Name the organs concerned in the digestion.

Answer.—Those of the alimentary canal are: Mouth, esophagus, stomach, small intestine, large intestine. In addition to the alimentary canal, there are the liver, pancreas and salivary glands.

2. Describe arterial circulation.

Answer.—The arterial circulation starts from the left ventricle by a single trunk, the aorta, which, after giving off branches to the head, sweeps back of the chest with a bold curve, and thence runs downward, dividing and subdividing like a tree into numberless branches, which at last penetrate every nook and corner of the body.—Steele.

3. How is the blood supply going to the various organs regulated?

Answer.—The supply is regulated by the size of the arteries. This gives the normal supply; but should an extra supply be needed the vaso-motor nerves are affected through the sympathetic system so as to increase the size of the artery, giving a greater supply of blood.

4. Name some foods rich in starch; gluten; albumen. Where is each digested?

Answer.—Starch is found in potatoes, beans, peas and grains. Gluten is the albumen of grain. Albumen is found in white of egg, lean meat and grains. Starch is digested in the mouth and albumen in the stomach. The process is completed in the small intestine.

5. What are the effects of alcohol upon the special senses?

Answer.—Taste is first affected and is usually destroyed. It is at least very much deadened, so the person affected often requires very highly seasoned food. Sight is probably the next one affected. The drinker sees "double;" the eyes become bloodshot, the sight is weaker, and these symptoms soon become permanent. Smell and hearing are also weakened, but the effect is less marked. The sense of touch is often nearly destroyed.

6. Discuss the skin as an excretory system and show how its structure is adapted to this function.

Answer.—The skin excretes carbon-dioxide, uric acid and

other impurities with the water of sweat. It assists very materially in the work of excretion, and if the perspiration were stopped the person would die of poisoning in a few hours. The skin is spread all over the body, giving large surface for excretion, and contains millions of excretory glands. This gives also a large surface for secretion from the blood.

7. How does the spine articulate with the skull?

Answer.—The skull articulates with the spine in a peculiar manner. On the top of the upper vertebra (atlas) are two little hollows nicely packed and lined with the synovial membrane, into which fit the corresponding projections on the lower part of the skull. And thus the head can rock to and fro. The second vertebra (axis) has a peg which projects through a hole in the first. The surfaces of both vertebrae are so smooth that they easily glide on each other, and thus, when we move the head sidewise, the atlas turns around the peg of the axis.—Steele.

8. Of what value to the eyes are the optic nerves; the aqueous and vitreous humors?

Answer.—The optic nerves are the nerves of sight and are located in the retina and connect to the brain, carrying the impressions of sight.

The aqueous and vitreous humors keep the eyeball distended and firm. They keep the inside of the ball moist so that the lenses, retina, etc., may be in a better condition to perform their work.

9. Name three common poisons and their antidotes.

Answer.—Arsenic, such as paris green, fly powder, rat poison, etc.: Give milk, white of egg, after inducing vomiting. Alkalies, such as potash, lye, etc.: Give weak vinegar or lemon juice. Follow with castor oil. Acids of any kind: Drink water or strong soapsuds. Mix chalk, soda, lime or whiting with water and drink freely.

10. Describe the structure and state the function of the cerebrum.

Answer.—The cerebrum fills the front and upper part of the skull and comprises about seven-eighths of the entire weight of the brain. It is a mass of white fibers, with cells of gray matter sprinkled on the outside or lodged here

and there in ganglia. It is so curiously folded and wrinkled as strikingly to resemble the meat of an English walnut. This structure gives a large surface for the gray matter, sometimes as much as six hundred and seventy square inches. The cerebrum is divided into two hemispheres, connected beneath by fibers of white matter. The cerebrum is the center of intelligence and thought.—Steele.

ORTHOGRAPHY.

Answers by Supt. A. L. Irey, Berlin Heights, Ohio.

AUGUST, 1906.

1. Give the meaning of each of the following prefixes: Equi, ante, anti, ob, and peri. Write words illustrating each of the following suffixes: Eous, tude, ess, ive, and ism.

Answer.—Equi, equal; ante, before; anti, against; ob, to, toward, against, or reversely; peri, around.

Eous, containing or attracting, or having the quality of, as **piteous;** tude, act of or condition of, as **multitudes, infinitude;** ess, a female, as **duchess, lioness;** we, tending to or having the quality of, as **oppressive, intensive;** ism, doctrine, as **Calvanism.**

2. Indicate the correct pronunciation of the following words: Acclimate, hypocrisy, truculent, tepid, satire, extol.

Answer.—ăc′ cli māte, hy pŏc′ ri sy, trū′ cū lĕnt, tĕp′ id, săt′ īre, ĕx tōl′.

3. Distinguish in meaning between assure and guarantee; habit and custom; veracity and voracity; antagonist and opponent.

Answer.—"Assure" means to establish one's confidence or faith or belief, while "guarantee" means to make good a failure to realize. "Habit" means the tendency to do, as the result of repeated acts, while "custom" means general practice as applied to a group of individuals, or a nation, or a race. "Veracity" means truthfulness, while "voracity" means greediness. An "antagonist" is one who is viciously and dangerously opposed or engaged in combat, while "opponent" is one who differs with another in theory or belief or argument.

4. Give three synonyms of **effective;** four **antonoyms of cowardly;** two plural forms of **index;** a homonym of **air.**

Answer.—Synonyms of "effective": Efficient, forcible, energetic, efficacious. Antonyms of "cowardly": Fear-

lessly, bravely, courageously, spiritedly. Plural forms of "index": Indexes and indices. A homonym of "air": Heir.

5. Define compound word; root word; derivative word.

Answer.—A compound word is one formed by the use of two or more simple words, as bookcase. A root word is a primitive word, or one which is not derived from any other word in the same language. A derivative word is one which is formed from some other word by adding a prefix or a suffix, or both, or by changing the form of the word.

SEPTEMBER, 1906.

1. Distinguish in meaning between authorized and authentic; wary and cautious; proclamation and announcement.

Answer.—To **authorize** is to delegate power to another. A state by means of its legislators may make a law that will authorize a magistrate to impose a penalty. Thus persons or a state may authorize. Anything is **authentic** when it is relied on as true and authoritative. **Wary** is a term applicable to mere animal self-preservation. An animal is wary but not cautious. A person needs to be wary as well as cautious in dealing wtih dishonest or designing persons. A parent is cautious if he tries to keep his child out of harm's way. Cautious applies to both physical and moral things, while wary applies to physical only.

A **proclamation** is a published order coming from the proper officer—as president, governor, mayor,—and bears reference to specific occasions, as Thanksgiving Day, Arbor Day, election day, etc.

An **announcement** gives formal notice to many or few. It is used of forthcoming books, etc., local events, as entertainments, weddings, etc.

2. Indicate the correct pronunciation of the following words: Granary, isolate, carbine, Roosevelt, manor.

Answer.—**Gran-a-ry**—g has the hard sound with a macron over it, and a and y are short with a breve over each; a, in the penult is short Italian with a semi-dieresis over it, accent on the antepenult; **is-o** or **i-so-lat**—in the first, **i** is short with a breve over it, in the second **i** is long with a macron over it, **o** is long with a macron over it, **a**, same as **o**, accent

on the antepenult; car-bine—c has a bar across it and is a substitute for k, a is Italian with a dieresis over it, i is long with a macron over it, accent on the penult; Ro-se-velt—o long with a macron over it, s is a substitute for z, and is marked with a suspended bar, both e's are short, with a breve over each, one c is silent, accent on the antepenult; man-er—a is short with a breve over it, e is tilde e with a wave or tilde over it, accent on the penult.

3. Give the etymology of any two words from the following list: Habit, educate, chauffeur, interfere, conduct.

Answer.—Habit is from the Latin habere from middle English habit or abit; educate is from the Latin e out, ducere to lead or draw; chauffeur is from the French; interfere is from the Latin inter—between, and fere to go or carry; conduct is from the Latin con with, and duco, lead.

4. Give a homonym for each of the following words: Nay, wrote, indict, pride, vile, pole, limb, course, feign, grip.

Answer.—Neigh, rote, indite, pried, vial, poll, limn, coarse, fain or fane, grippe.

5. This slip is to be detached and the following words are to be pronounced by the examiner: Complacency, ardor, antique, rulable, aggrandize, ceremonial, ammonia, entomb, affiliate, tenement, cycle, deterred, bridging, intercede, passionate, decisive, tympanum, college, colleague, axiom, tryst, willful, zigzag, saucy, indelible, propagate, rueful, rhomboid, hysterics, immerse.

OCTOBER, 1906.

1. Indicate the correct pronunciation of the following words: Amenable, exquisite, Mackinac, prestige, patriotism.

Answer.—A mē′ nā b'le; ĕx′ qui (kwĭ) sit;. Măck′ ĭ năc; prĕs′ tig; pā′ tri ŏt ism.

2. Mention three diacritical marks which are used to designate the sounds of consonants. Write words to illustrate the use of each in this capacity.

Answer.—The macron through c gives it the sound of k as c in can. The semi-dieresis over g gives it the sound of j as g in gem. The suspended bar under s gives it the sound of z as in rose.

Others in common use are the cedilla under c as in cent, the macron over g as in get, the suspended bar under x as exist, the wave or tilde over n as in cañon, the macron under n as in think.

3. Define and tell from what language are taken, five of the following: Alias, post mortem, cicerone, sine die, en route, fac simile, apropos, bona fide, sang froid, incognito.

Answer.—Alias, **an assumed name; otherwise called;** is derived from the Latin. Post mortem, **an examination of the body after death;** is derived from the Latin. Cicerone, **one who explains the interesting associations of a place; a guide;** is derived from the Italian. **Sine die,** without day; used in connection with an adjournment of an assembly without any specific day or time for reassembling. It is derived from the Latin. **En route,** meaning on the way, is derived from the French. **Facsimile** means an exact copy or counterpart. It is derived from the Latin. According to the Century Dictionary this word is erroneously written as two words, fac simile, or with a hyphen, fac-simile. **Apropos,** meaning, **to the purpose; opportunely; by the way,** is derived from the French and the Latin. **Bona fide, with** good faith; with sincerity; genuinely. It is derived from the Latin. **Sang froid;** indifference, coolness in trying circumstances. It is derived from the French. **Incognito,** meaning **in disguise,** is derived from the Italian and the Latin.

4. Write and define two homonyms each of born, palate, and sight.

Answer.—Two homonyms of born are **borne,** meaning carried, and **bourn** or **bourne,** which means goal or limit; two homonyms of palate are **palette,** a tablet on which a painter mixes pigments; and **pallet,** a small bed, especially of straw; two homonyms of sight are **cite,** to summon, to quote; and **site,** place, situation.

5. This slip to be detached and the words are to be pronounced by the examiner.

Cursory, succeed, inoculate, promontory, frolicking; oatmeal, sclerotic, disseminate, chargeable, mosquitoes; duteous, admissible, lullaby, common pleas court, reprisal; Cossacks, nullify, aquatic, Apollo, juvenile.

NOVEMBER, 1906.

1. Distinguish between the following words: Noted and notorious; bring and fetch; lie and dissemble; arid and sterile; abettor and accessory.

Answer.—**Noted** is used to signify whatever is known—well, favorably, or eminently; **notorious** signifies anything publicly or generally known or spoken of in a bad sense; a **lie** is a falsehood spoken for the purpose of deceiving; **dissemble** relates to a false impression produced on others; **arid** in its literal sense, means dry; without moisture; parched with heat; **sterile** means unfruitfulness, barrenness; an **abettor** urges and promotes, while an **accessory** aids or assists. Thus we say a noted man or woman, statesman, deed, and a notorious crime, scoundrel, etc.; an arid region, a sterile field; he was an **accessory** before the fact, i. e., concealed the doer of a felony; an abettor takes no direct part.

2. Divide the following words into syllables: Physiology, scrutinize, precedence, peculiarity, acumen.

Answer.—Phys ĭ ŏl′ ō gy, pre cē′ dence, scrū′ ti nīze, pē cū lĭ är′ ĭ ty, a cū′ mĕn.

3. Do you consider oral or written spelling the best test of a pupil's knowledge? Why?

Answer.—The best practical test of a pupil's knowledge is written spelling. Few pupils, aside from those whose vocations are typewriting, etc., will have occasion to use any other after leaving school. However, there is, in some places, a tendency to return to oral spelling. A few pupils in every school will spell well when writing, even though they have learned orally, but they are the "natural" spellers, and with them teachers have no worry. The other class, who have learned orally, will spell quite well by the same method, but when writing will spell Gaul, Gall, stopped, stoped, water, watter, doubt, dout, and so on, need to fix the impression by practicing the method they will use after leaving school—namely, that of writing it. My own observation, limited though it is, causes me to conclude that the pupil who recites his spelling lesson by writing it usually is a poor oral speller, while the reverse is also true. So many elements enter into the prob-

lem that it is quite difficult to reach an unassailable conclusion. The ideal is to have a pupil spell correctly by whatever method he happens to need to use. But if this cannot be reached then that method which will give the best results when put to its practical use is the one to be selected, and that undoubtedly is the written.

4. Define suffix; prefix; affix. Illustrate.

Answer.—A suffix is a letter, syllable or word placed after a word or root to modify its meaning, as, flyer. An affix is either a suffix or a prefix, as **accountant.** A prefix is a letter, syllable or word placed before another word or root, as, absolve.

5. Write words illustrating two sounds of n, ch, oo, y (as a vowel), c.

Answer.—N in canon (a deep gorge) is equivalent to ny; n in thank is equivalent to ng, and n in name has its normal sound. Ch in chaise is equivalent to sh, and in chasm, to kh or k. C has no sound of its own, being called redundant. oo in foot and in hoof is equivalent to u in pull and u in rude respectively. y in eye is a vowel having the sound of long i, and in hymn it is a vowel equivalent to short i. c in cat is an equivalent of k, and in cent an equivalent of s.

6. Apparel, edible, erroneous, tranquility, chargeable, disseminate, hygiene, pursue, asbestos, shoeing, tryst, affable, leisure, Chesapeake, promptitude, alphabet, punctuate, correlate, butterflies, contagious, homicide, loneliness, Mediterranean, porous, derelict.

DECEMBER, 1906.

1. Write all of the vowels of the alphabet, with diacritical marks to indicate all of the respective sounds of each.

Answer.—The vowels are a, e, i, o, u, and w and y. A has six sounds, as follows: Long ā, with a macron over it; short ă, with a breve over it; Italian ä, with a dieresis over it; short Italian â, with a semi-dieresis over it; â, with a caret over it, as in câre; broad a, with a dieresis under it.

E has three sounds: Long ē, with a macron over it; short

ĕ, with a breve over it; e with a tilde over it, as in term, her.

I has two sounds: Long ī, with a macron over it; short ĭ, with a breve over it.

O has three sounds: Long ō, with a macron over it; short ŏ, with a breve over it, and o as in do, sometimes called slender o, marked with a dieresis under it.

U has four sounds: Long ū, with a macron over it; short ŭ, with a breve over it; u with a semi-dieresis under it, as in full, and û, with a caret over it, as in pûrge.

Y as a vowel is a substitute for other letters—short and long i. W is a vowel when preceded by a vowel, as in show.

2. Write the name for each of the last three syllables of a polysyllabic word.

Answer.—The last syllable is called the ultimate or ultima; that next the penultimate or penult, and the third the ante-penultimate or ante-penult.

3. From each of the following words form two derivatives: Moment, noble, peace, agree, cause.

Answer.—From moment, momentous, momentary, etc.; noble, nobleness, nobler, etc.; peace, peaceable, peaceful, etc.; agree, agreement, agreeable, etc.; cause, caused, causation.

4. Write three words in which "th" is used as an aspirate; two in which it is used as a subvocal.

Answer.—Three words in which th is used as an aspirate are thin, thank, thought; two in which it is used as a subvocal are this, that.

5. Indicate the correct pronunciation of the following words (accent, syllabification and diacritics): Affluent, imperious, heirloom, indict, turquoise.

Answer.—āf′ flu ēnt, ĭm′ pi ous, heir′ loom, in dīct′, tur′ quoise (ter koiz or ter kēz′). The Century Dictionary says turquoise is a word of unstable form and pronunciation.

6. This slip is to be detached and the words are to be pronounced by the examiner:

Appealing, vengeance, appalling, mendicant, besotted, thievery, apostle, sanction, sequester, troublesome, irreducible, solos, liquefy, abate, promissory, drudgery, Uhrichs-

ville, curiosity, bossism, enamel, quorum, apothecary, scintillate, Marietta, tweezers.

JANUARY, 1907.

1. Mark the vowels in each of the following: Feint, melee, sluice, sough, avalanche.

Answer.—Feint, melee, slūice, sough, āvalānche. E in feint is pronounced as long ā. The first and second e in melee are pronounced as long ā.

2. Explain the difference between accent and emphasis.

Answer.—Accent is a more forcible enunciation of one syllable of a word, while emphasis, a broader term, is a more forcible enunciation of a syllable, word, phrase or sentence than others.

3. Spell correctly and define the following: Conicle, manical, barnical, phonetical, monocle.

Answer.—Conical, shaped like a cone; manacle, to handcuff or bind the hands; barnacle, a kind of shellfish that adheres to rock, vessels, etc.; phonetical, relating to sound or voice, phonics; monocle, a glass for one eye.

4. Supply the missing prepositions in the following: (a) I differ ——— you; (b) I am disgusted ——— it; (c) His performance was good, but not equal ——— yours; (d) He was inured ——— hardships; (e) Distinguish ——— the three following words.

Answer.—(a) I differ from you; (b) I am disgusted with it; (c) His performance was good, but not equal to yours; (d) He was inured to hardships; (e) Distinguish between the three following words. (Use **between** here instead of **among**, because each word is compared with each of the other two.)

5. Give one homonym of each of the following words: Rouse, muscle, loot, plate, time.

Answer.—**Rouse,** rows (noun, meaning quarrels); **muscle,** mussel; **loot,** lute (not an exact homonym, for oo and u are not identical in sound); **plate,** plait; **time,** thyme.

6. This slip is to be detached and the words are to be pronounced by the examiner:

Decipher, beguile, promontory, trestle, commodious, indispensable, condolence, penance, plague, adamant, gos-

samer, Lybian Desert, chamois, cantos, reversible, decorator, gymnast, lexicon, adequate, lesion, menacing, peaceable, shoeing, Maumee, spaniel.

FEBRUARY, 1907.

1. What letters of the alphabet are sometimes called liquids? Why are they so called?

Answer.—The letters l, m, n, and r are called liquids because their sounds so readily unite with the sounds of other letters—"flow into" other sounds.

2. What name do you apply to words of one syllable? Two syllables? Three syllables? More than three syllables? Divide the following into syllables? Arabian, liquefy, religious, courtesy.

Answer.—A word of one syllable is called a monosyllable; a word of two syllables is a dissyllable; a word of three syllables is a trissyllable; a word of four or more syllables is a polysyllable. A ra′ bi an, liq′ ue fy, re lig′ ious, court′ e sy, or court esy, as the e may be silent.

3. Define the following: Derivative word, secondary accent, breve.

Answer.—A derivative word is one which is formed by using some other word in the same language as the root or base and by the use of a prefix or suffix or both, such as **illegally.** A secondary accent is one which receives a less prominent stress of voice than the primary or chief accent; as ir″ re pres′ i ble. The secondary accent is on the second syllable and is indicated by the two accent marks, while the primary accent on the fourth syllable is indicated by the single accent. A breve is a small curve (˘) placed over vowels to indicate the short sound.

4. Write two homonyms of isle, air, corse, fane and idle.

Answer.—Aisle, I'll; heir, ere; course, coarse; feign, fain; idol, idyll.

5. Mention three arguments either in favor of or against "simplified spelling."

Answer.—Arguments against it: It would in many cases destroy the value of etymology; it would need to be applied to thousands of words in order to be general enough to be valuable; to learn to spell in this way would be as difficult as to acquire a new language.

6. This slip is to be detached and the words are to be pronounced by the examiner:

Palatial, oracle, physics, hoping, rumored; racial, coroner, affidavit, cuticle, excise; interment, negroes, Japanese, plaid, Vesuvius; dirge, dirigible, kerosene, psychology, pagan; frugality, rebate, hemorrhage, adage, auricle.

MARCH, 1907.

1. Define antonym, ultima, lingual, diphthong, aspirate.

Answer.—An antonym is a word whose meaning is directly opposite that of another, as, sour, sweet.

(b) An ultima is the last syllable of a word, as, ter, in better.

(c) A lingual is a consonant whose sound is made by aid of the tongue, as, aspirate th, subvocal th, and d, l, n, r, t, y.

(d) A diphthong is the union of two vowels in the same syllable either or both of which may be vocalized. When both are sounded the combination is called a proper diphthong, but when one is sounded the combination is called a digraph or improper diphthong.

(e) An aspirate is a consonant which represents mere breathing, generally modified by the organs of speech, as, c, f, h, k, p, q, s, t, ch, sh, wh and aspirate th.

2. Write five derivative words, pointing out and defining the prefixes and suffixes.

Answer.—Manly, **ly** meaning like; boyish, **ish** meaning state or condition of or like; conductor, the prefix **con** means with, the suffix **or** one who; monograph, the prefix **mono** means one; reduplicate, the prefix **re** means again.

3. Give the rule of spelling governing each of the following: Moneys, stopping, benefited, genii.

Answer.—For moneys, words ending in y preceded by a vowel form their plural by adding s to the singular. For stopping, words (monosyllables) ending in a single consonant preceded by a single vowel double the final letter when a suffix beginning with a vowel is added. For benefited, words not accented on the last syllable and ending in a single consonant do not double the consonant when a suffix is added. For genii, words of foreign origin and

whose plural has two forms and meanings form one plural by following the law of their own language in the formation of plurals.

4. Write words illustrating two sounds each for g, n, and th.

Answer.—Girl, gem; can, thank; this, think.

5. This slip is to be detached and the words are to be pronounced by the examiner:

Deviate, interment, concession, gossamer, weasel, chargeable, illegible, onyx, paramount, dolorous, affidavit, nasturtium, grievance, niche, truism, bisector, euphony, boredom, millinery, peevish.

APRIL, 1907.

1. What is phonetic spelling? Name two arguments in favor of it and two arguments against it.

Answer.—Phonetic spelling consists in uttering in their proper order the elementary sounds of a word. Skill in making out new words and increased accuracy in the pronunciation of words result from persistent drill in phonetic spelling.

2. Define and illustrate: Derivative word; trisyllable; affix.

Answer.—A derivative word is a word formed from another word, as a base, by adding an affix or by making a change in the word, as, swiftness, from **swift** and **ness**; wrought, from **work**; forswear, from **for** and **swear.** A word of three syllables is a trisyllable, as, syllable. An affix is either a prefix or a suffix, as, male and or, in malefactor.

3. Name two expressions for which each of the following abbreviations stands: St., D. C., sec., A. M., M.

Answer.—St., street or saint; D. C., District of Columbia and da capo (in music); sec., second or secretary, secant, section, etc.; A. M., forenoon, Master of Arts; M., noon or thousand.

4. Indicate the correct pronunciation (accent, diacritics and syllabification) of the following words: Seive, wainscot, Arab, naught, tirade.

Answer.—Seĭve, wān′ scŏt, Ar′ ab, naught, tĭ rāde′.

5. Explain the difference in meaning between the prepositions in the following pairs: Among, between; beneath, below; across, through.

Answer.—Among refers to more than two, as, among thieves, divide the money among them; between refers to two, as, nothing lies between him and freedom; beneath is close under; below, lower than the plane of, as in Tennyson's "Princess," IV, "withal we love below the verge;" beneath the same roof, beneath contempt, but Shakespeare, in "King Lear," IV, 6, says, "For all beneath the moon;" on the street below our house.

6. This slip is to be detachel and the words are to be prouounced by the examiner:

Inventor, equipage, deify, spacious, mottoes, souvenir, deluded, obeisance, socialism, donkeys, lovable, doggerel, numerator, cantos, employee, doleful, transmitted, tongue-tied, enamel, harass, bisector, official, shoulder blade, Manhattan, rancor.

MAY, 1907.

1. Write five prefixes in common use and give the meaning of each.

Answer.—Pre, before; con, with; de, from, etc.; in, into; ab, away.

2. What is a compound word? Is the present day tendency in spelling for or against the use of the hyphen?

Answer.—A compound word is a word composed of two simple words, as, bookkeeping, dark-eyed, befall.

The present tendency is against the use of the hyphen.

3. Distinguish between the words in the following pairs: Mandate, command; desire, yearning; hazardous, foolhardy; book, pamphlet; disturbance, riot.

Answer.—A mandate is an official or authoritative command. It is not applied to the acts of collective legislation. Its source is always personal. A command comes from one who is in permanent authority, station, office, etc. A command may be latent. A mandate may have as its source a symbol, as a flag.

A desire is an emotion directed to the attainment or possession of an object, from which pleasure, whether sensual, intellectual or spiritual, is expected, or a passion

consisting in uneasiness for want of the object toward which it is directed.—[Cent. Dic.] A yearning is a strong feeling of pity or of tenderness.—[Cent. Dic.] Desire has a broader application, as will be seen from the quoted definitions.

Members of a life-saving crew lead hazardous lives. If they were put to sea in a storm when there was no wreck or no one to succor, their act would be foolhardy.

A book contains more pages than a pamphlet, is more substantially bound. Sometimes a pamphlet has a light cover.

A disturbance is interruption of arrangement or order. It may be physical or mental. A riot is a violent disturbance arising from wanton and disorderly conduct in which three or more persons are engaged.

4. Write five diacritical marks in common use and state the function of each.

Answer.—The macron (–) over vowels indicates their long sound; under the vowel e, indicates the sound of long a; across c, the sound of k, th, subvocal th, as in that; over g, hard g, as in girl.

The breve (˘) over vowels indicates their short sound.

The dieresis (¨) over a indicates Italian a, as in arm; over i, shows that it is a substitute for long e, as in valise; the caret (ˆ) over the vowels a and e indicates their modification by r in the same syllable, as in where; the semi-dieresis over a indicates short Italian a, as in ask; over o, a substitute for short u, as in son; under o and u, as in wolf, showing the o to have the sound of u.

This slip is to be detached and the words are to be pronounced by the examiner.

5. Advice, anchor, appall, apparent, acidity; evergreen, exonerate, exaggerate, eyelet, erroneous; industrious, inducement, implacable, irate, immoderate; overture, officious, ogre, onerous, obliging; usury, ultimate, unique, unctuous, unraveled.

JUNE, 1907.

1. Classify words according to the number of syllables they contain and give an example of each class.

Answer.—Monosyllables—words of one syllable; as, one; dissyllables—words of two syllables; as, advance; trissyl-

lables—words of three syllables; as, syllable; polysyllables—words of four or more syllables; as, certificate, transubstantiation.

2. Define the following: Diacritics, liquids, cognates, trigraph, antonym.

Answer.—(a) Diacritics are marks used to indicate the phonic value or sound of letters, thereby aiding in the pronunciation of syllables and words.

(b) Liquids are those letters (l, m, n, r) in the uttering of which there is a freely continuable sound.

(c) Cognates are those sounds and letters in the uttering of which the same organs of speech are in a similar position; as, p, b, etc.

(d) A trigraph is the union of three vowels in a syllable, only one of which is sounded; as, eau.

(e) An antonym is a word whose meaning is opposite that of another; as, bitter, sweet.

3. Indicate the correct pronunciation of the following: Synagogue, despicable, thyme, contour, infantile.

Answer.—Syn′ a gŏgue, dĕs′ pĭ ca ble, thyme, cŏn töur, ĭn′ fan tĭle, or tīle. Contour may have the accent on con.

4. Distinguish in meaning between the words in the following pairs: Agile, swift; frolicsome, mischievous; careless, slovenly; epidemic, plague; accident, casualty.

Answer.—Agile is a broader term than swift. It applies both to mind and body. We say an agile but not a swift mind; a swift train but not an agile. The flight of a bird is swift, but the movement of a serpent is agile.

That which is mischievous is hurtful, harmful or tends to produce harm, while that which is frolicsome is full of gaiety and mirth only. The careless person is the unthinking, heedless one; the slovenly, is the untidy, extremely careless. That which is epidemic is less violent than a plague. However, smallpox is said to be epidemic. In a plague there is high mortality. An accident happens or begins to be without design; a casualty is an unfortunate accident—one that results in bodily injury or death. Casualty is used of disability or loss of life in battle or military service.

5. Write five words, of more than one syllable each, for

which two spellings are allowable (do not use phonetic spellings).

Answer.—Traveler, traveller; riveted, rivetted; dieresis, diaeresis; naturalize, naturalise; sextet, sextette, etc.

6. Divisible, nuptial, Sacramento, articulate, prodigy, fiendish, corpuscles, antedate, effervesce, derelict, sociology, Sitka, imperishable, dominoes, Rebecca, ensuing, decalogue, whittle, fiscal, jaundice, exempt, reactionary, momentous, shoeing, referee.

JULY, 1907.

1. Discuss the relative advantages of oral and written lessons as tests of a pupil's ability to spell.

Answer.—In oral spelling any pupil spells but a part of the lesson, while in written he spells all. Hence, his ability to spell well is tested better by written spelling.

2. Indicate the correct pronunciation (accent, division into syllables, and diacritics) of the following words: Recess, pianist, idea, combative, scallop.

Answer.—Rē çess′, pī ăn′ ĭst, ī dē′ a, cŏm băt′ ĭve, scăl′ löp. or skŏl′ löp. Combative may have the primary accent on com.

3. Define five of the following: Antipodes, terrestrial, anecdote, trophy, salutary, whey, indigenous, wraith.

Answer.—Antipodes are persons who live at diametrically opposite points of the globe. It is also applied to things or places on directly opposite sides of the globe. **Terrestrial** pertains to the earth; something existing on the earth. An **anecdote** is a short narrative of a particular incident or occurrence of an interesting nature. An anecdote is always reported as true. A **trophy** is anything taken and preserved as a memorial of victory; as, flags, cannon, etc., captured from an enemy. **Salutary** means contributing to or promotive of some beneficial or profitable purpose; wholesome, healthful. **Whey** is the serum of milk; that part of milk remaining after the proteids have been coagulated. Anything **indigenous** is native to a particular place or country; produced naturally. A **wraith** is an apparition in the exact likeness of a person, supposed to be seen before or soon after the person's death.

4. Write a homonym of each of the following: Flocks,

flow, symbol, surge, sucker. Write a synonym of each of the following: Wretch, appease, dense, idolize, death.

Answer.—Phlox, floe, cymbal, serge, succor; scoundrel, allay, compact, reverence, decease.

5. Write the abbreviation for five of the following found in the dictionaries: Colloquialism, Anglo-Saxon, obsolete, synonym, diminutive, poetical.

Answer.—Colloq., A. S., abs., syn., dim., poet.

6. Spell correctly the following words to be pronounced by the examiner:

Alcohol, reunion, granary, Thackeray, miracle, wizard, edible, plantain, sausage, thievery, domineering, insolence, copious, rancor, sleuth, measles, ecstasy, anchorage, shampoo, stupefy, fiendish, Valparaiso, tussle, rhubarb, satchel.

LITERATURE.

Answers by Supt. C. E. Thomas, A. B., Arcanum, O.

AUGUST, 1906.

1. Discuss the Canterbury Tales, the Fable for Critics or the Idylls of the King, touching on the author; plan of the work; place in literature.

Answer.—"The Canterbury Tales," written by Chaucer, about 1390, are a series of stories told by a company of pilgrims on their journey to the tomb of Thomas à Becket, who was archbishop of Canterbury in the reign of Henry II, and who was assassinated in 1171 and three years later canonized. These pilgrims are from every station in life, and each undertakes to tell two stories going and two returning, and the host of Tabard Inn was to be the judge as to whose stories were the best. To make it all seem more real Chaucer places himself among the travelers and tells his stories with the rest. It is probably Chaucer's best production, although it was left unfinished.

"The Fable for Critics" was written by James Russell Lowell, and was one of Lowell's greatest poems. The Fable itself was tame, but the style and his criticism of authors have continued to live.

"Idylls of the King" was written by Tennyson about 1858, and is one of Tennyson's best, noted for the sincerity, tenderness, sympathy, and power of the delineation of the complex in character.

2. Why are Washington Irving's writings specially suited to class-room study?

Answer.—Because he transferred the literary center of this country from New England to New York; his literary work made a new epoch in American literature; his style is interesting to young people; his language is such as may be studied profitably by young people.

3. With what American historians are you familiar?

What do you consider the best comprehensive history of the United States? Why?

Answer.—Answers will differ. Such works as the following may be mentioned: Bancroft's History of the United States, Francis Parkman's historical works, those of William H. Prescott, Thomas Wentworth Higginson, John Lathrop Motley, Richard Hildreth, Jared Sparks, John Clark Ridpath, and others. As to the best comprehensive history of the United States, much depends upon how "comprehensive" is meant. Henry W. Elson has written an interesting and teachable text on this subject. Others might be named.

4. Give the name of one poem written by each of the following: William Cullen Bryant, Robert Burns, Lord Byron, Henry Wadsworth Longfellow, Alexander Pope, an American poetess.

Answer.—William Cullen Bryant, "Thanatopsis"; Robert Burns, "The Cotter's Saturday Night"; Lord Byron, "Childe Harold"; Henry Wadsworth Longfellow, "Courtship of Miles Standish"; Alexander Pope, "Essay on Man"; Helen Hunt Jackson, "Habeas Corpus," a poem of great lyric power.

5. Compare any two of the poets mentioned in the previous question.

Answer.—Bryant was the poet of Nature, and Longfellow the poet of Childhood. Bryant saw the wonders, mysteries, and beauties of the natural world; Longfellow saw particularly the loveliness and sacredness of child life.

6-7. Discuss fully either of the following topics: English satirists; the Brook Farm experiment.

Answer.—The school of English satirists was made up of John Dryden (1631-1700), Alexander Pope (1688-1744), Jonathan Swift (1667-1745), Daniel Defoe (1661-1731). Unfortunately they wrote, in the main, to please the age in which they lived, and the age was not one of good morals and good manners. The theaters were again thrown open and the plays were of a lower order than those of Shakespeare in the sixteenth century.

The Brook Farm experiment of 1841 was made by a number of "dreamers," or transcendentalists, who were to

conduct the farm on the labor of each individual who was to work a few hours each day and spend the rest of the time in social and intellectual pursuits. Nathaniel Hawthorne, R. W. Emerson, A. Bronson Alcott, Theodore Parker, Margaret Fuller (afterwards Madame Ossoli), and Henry David Thoreau were interested in it. The community held together for seven years.

8. Is the Book of Job literature? Why, or why not?

Answer.—Yes, of a high grade. It contains the elements of human interest and is written in an attractive style.

9. Upon what production does the fame of Edmund Spenser rest? Jonathan Swift?

Answer.—Edmund Spenser (1552-1599) is known chiefly through "The Faerie Queene," although it was never more than half completed. He planned twelve books, but wrote only six. Each book was to celebrate the victory of some virtue over its contrary vice.

Jonathan Swift (1667-1745) is best known through his "Gulliver's Travels."

10. Make a list of five representative historical novels.

Answer.—Ivanhoe, To Have and to Hold, John Marmaduke, The Conqueror, The Spy.

SEPTEMBER, 1906.

1. Who was America's first great poet of nature? Mention at least two of his poems which show this love of nature.

Answer.—(a) William Cullen Bryant. (b) Thanatopsis, To a Waterfowl, The Prairies, The Yellow Violet, To the Fringed Gentian.

2. Who was Noah Webster? Daniel Webster? What did each contribute to our literature?

Answer.—Noah Webster, an American scholar, author of the unabridged dictionary. Daniel Webster, American statesman and orator. Reply to Hayne, and Bunker Hill Monument Oration.

3. Name the distinctive characteristics and at least three writers of the Revolutionary period of American literature.

Answer.—(a) The last thirty years of the eighteenth

century belong to this period. "There were more good speeches than good writings; and our knowledge of these speeches is derived mainly from fragmentary hearsay reports, the modern art of shorthand reporting not being at that time in operation. The writings, again, are for the most part strongly political; they are important for the ideas expressed rather than for the manner of the expression. They attracted, no doubt, wider attention than any previous American literary production; but it was the attention, not of critics, but of statesmen and politicians." (Hawthorne and Lemmon.)

(b) Jefferson, Adams and Hamilton.

4. Show that Lowell was at once critic, poet and essayist.

Answer.—Poems: Vision of Sir Launfal, First Snow Fall. Criticism: Fable for Critics. Essays: Among My Books, My Study Windows, Political Essays.

5. Mention five of the world's most famous biographies; three of its most famous autobiographies.

Answer.—(a) Boswell's Life of Johnson. Macaulay's Essays on Milton, Addison, and Hastings. Carlyle's Essay on Burns.

(b) Franklin's Autobiography. De Quincey's Confessions of an Opium Eater. Anthony Trollope's Autobiography.

There are a number of semi-autobiographical works which are famous. Among them are David Copperfield and Jane Eyre.

The above list of biographies and autobiographies is only suggestive and probably no two persons would give the same list.

6. What is folk lore? How might folk songs and stories be used in connection with the work of the school?

Answer.—(a) Tales, legends, or superstitions long current among the people. (Webster's Dictionary.)

(b) Some of our best literature deals with these subjects. Example, King Arthur and the Round Table Stories, Irving's and Hawthorne's Stories.

7. Tell what you can of the Elizabethan Age of English literature.

Answer.—"Elizabethan literature is so extensive and the

period was marked by so great an advance that specimens of many different types are embraced in it, but we can safely say that its thought element rests on a broader and profounder philosophy and its form is more varied, and the mental tone it expresses is more vigorous than those of any other epoch." (Johnson.)

Its great prose writer was Bacon; great poet, Spencer, and its three greatest dramatists were Marlowe, Shakespeare, and Ben Jonson. It had a host of minor writers who might have been considered great in any other age.

8. Why is Cooper often called the "Scott of America"?

Answer.—Their novels are widely read. Neither was wholly successful in his treatment of heroes and heroines; both have long introductions and plots somewhat "loose jointed," but both have the ability to hold their readers' attention when it was once gained. Both had the "faculty of realism in the treatment of minor incidents and characters." Both founded their novels on incidents of home history among home scenery.

9. Discuss the nature of the writings of any two of the following: John Godfrey Saxe, Louisa May Alcott, Bayard Taylor, Josiah Gilbert Holland.

Answer.—John G. Saxe (1816-1887), a humorous and satirical poet of the better class, author of "The Proud Miss McBride," and "The Rhyme of the Rail." (Hawthorne and Lemmon.) Louisa M. Alcott, author of "Little Women," and other charming books for children. (H. and L.) Bayard Taylor (1825-1878), was a traveler, journalist, novelist and poet. He published eleven volumes of travels, four novels, a "History of Germany," two volumes of Critical Essays on literary subjects, his translation of "Faust," and thirteen volumes of poems. The "Song of the Camp" before Sevastopol is, in its simplicity and unified effect, worthy of Longfellow. (Johnson.) J. G. Holland (1819-1881), wrote numerous novels, poems and papers, all of which were successful. Among them may be mentioned Miss Gilbert's Career, Plain Talk on Familiar Subjects, Kathrina, Arthur Bonnicastle and The Mistress of the Manse.

10. Locate each of the following quotations:

(a) "All the world's a stage
And all the men and women merely players."

(b) "The boast of heraldry, the pomp of power,
And all that beauty, all that wealth e'er gave,
Await alike, the inevitable hour:
The paths of glory lead but to the grave."

(c) "Life is real! Life is earnest!
And the grave is not its goal."

(d) "The evil that men do lives after them;
The good is oft interred with their bones."

(e) "To him who in the love of Nature holds
Communion with her visible forms, she speaks a various language."

Answer.—(a) Shakespeare's As You Like It, Scene 2, Act VII. (2) Gray's Elegy. (c) Longfellow's Psalm of Life. (d) Shakespeare's Julius Caesar, Scene 2, Act. III. (e) Bryant's Thanatopsis.

OCTOBER, 1906.

1. Mention two English and three American orators whose best efforts have become a part of literature. Name two selections written by the above that are suitable for school study.

Answer.—(a) English: Burke, Fox, Pitt. American: Webster, Clay, Calhoun, Lincoln. (b) Conciliation with America by Burke, Bunker Hill Monument Oration by Webster.

2. Write the full names of the five greatest American poets and the name of a poem written by each.

Answer.—Henry Wadsworth Longfellow, Evangeline; William Cullen Bryant, Thanatopsis; James Russell Lowell, Vision of Sir Launfal; John Greenleaf Whittier, Snow-Bound; Edgar Allen Poe, The Raven.

3. Where was Whittier born? In what paper were his first poems published? What were his chief characteristics as a man?

Answer.—(a) Haverhill, Mass. (b) First poem in Newburyport Free Press. (c) Whittier was shy and modest. He had both physical and moral courage. He always

wanted to know where men stood on moral and political questions. Though a politician, he was never selfish, but worked for the cause alone. "He was a staunch friend, and a helpful neighbor." He was deeply religious, yet his seriousness was relieved by a keen sense of humor.

4. What are the requirements of the essay as to subject and form of literary expression? Who are our most famous American essayists?

Answer.—The formal essay seeks to give definite and accurate information and instruction. It is a species of exposition, rather brief in form, impersonal in tone, addressed to the intellect, and aiming to treat its subject exhaustively though not necessarily in minute detail. The formal essay is primarily critical or scientific in character rather than descriptive. The purpose of the critic is not chiefly to find fault. His true function is to give a fair view of the subject. A critic should have a definite and authorized standard of criticism, based on his own thorough investigation and that of other specialists. He should have keenness of perception for new truth, without a foolish anxiety to adopt the new merely because it is new. Above all he should be fair-minded and able to give judgment unbiased by personal prejudice. (Lockwood and Emerson.) (b) Emerson and Lowell.

5. With regard to each of the productions mentioned below, fill the blanks in the following: Written by ————, in the ———— quarter of the ———— century: Twice Told Tales, Uncle Tom's Cabin, Snow-Bound, first issue of Poor Richard's Almanac, Beginnings of New England.

Answer.—Twice Told Tales, by Hawthorne, written in second quarter of nineteenth century; Uncle Tom's Cabin, by Stowe, third quarter of nineteenth century; Snow-Bound, by Whittier, third quarter of nineteenth century; Poor Richard's Almanac, by Franklin, second quarter of eighteenth century; Beginnings of New England, Fiske, fourth quarter of nineteenth century.

6. Compare the style of Hawthorne with that of Poe.

Answer.—Higginson says: "Poe probably stood next to Hawthorne in the vividness of personal impression which

he produced upon those who saw him." Vincent says: "Poe's genius was essentially journalistic. In his prose writing he aimed at an immediate effect and knew exactly how to produce it. His style often glows with prismatic colors, but the colors seem to be refracted from ice. There is no warmth, no sweetness, no lovable and human quality. All the pronounced characteristics of Poe's style are intensely and coldly intellectual. It is easier to admire his use of language than to like it."

"In Hawthorne there are no wasted or superfluous sentences, not even a word in excess. Something inexorably logical enters into his work, as in the poetic art. This economy extends to his books as a whole. For stories so rich in ideas, so heavy with suggestions, they are short rather than long. Yet the movement is always leisurely. There is no haste or eagerness. A few strokes of the pen, made with restful deliberation, serve to carry the reader into the very heart of a tragedy. He cannot but admire the superb strength which with so little visible effort could bring him so far."—Vincent.

7. Mention one of the world's great authorities upon each of the following subdivisions of history: Rome, Greece, the Middle Ages, the Dutch republic, the United States.

Answer.—Rome, Gibbon; Greece, George Grote; Middle Ages, Guizot; Dutch republic, Morley; United States, Bancroft. The answer to this question will depend largely upon whether sources or secondary authorities are meant. No historian is likely to be best for all phases of a period.

8. Mention three of Shakespeare's comedies and write a quotation of at least five lines from one of his tragedies.

Answer.—(a) Merchant of Venice, As You Like It, The Tempest.

"Be thou familiar, but by no means vulgar.
Those friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel;
But do not dull thy palm with entertainment
Of each new hatch'd, unfledg'd comrade."

—Hamlet.

NOVEMBER, 1906.

1. Discuss American poetry prior to the time of Bryant.

Answer.—"The birth in America of true poetry was long delayed. Verses were occasionally written—didactic homilies in rhyme, political jingles, sentimental clap-trap, and the like. Even Hopkinson's 'Hail Columbia' and Francis Scott Key's 'Star Spangled Banner' are nothing apart from their musical setting. The first poem, rightly so called, to appear on these shores was written by a lad of eighteen, was known by the somewhat repellant title of 'Thanatopsis' and was published in 1817. Something of this dearth may be due to the fact that the Americans were an English speaking people and that the mother country supplied poets enough for two. The clergymen of New England, like the priests of the Middle Ages, were the chief depositaries of learning, and since the clergy were opposed on principle to any other poetry than might be found in a psalm book there was little chance for the muse in that direction."—Hawthorne and Lemmon.

2. What do you consider Hawthorne's masterpiece? Give reasons.

Answer.—(a) Scarlet Letter. (b) It is the best of English; it is delicate. "He declined to tell the story of the enacting of the sin, for that, however interesting from the sensational point of view, was vulgar and commonplace and involved no spiritual lesson." He has created four of the world's great characters in fiction. He shows vividly the consequences of sin upon the natures of Dimmesdale, Hester Prynne and Chillingworth, how they work out their several destinies, and a solution finally reached has the inevitable force of a living experience. We see the effect of Hester's loss of beauty in the growth of her soul. The child Pearl is made a part of the mother's discipline. Chillingworth pursues Dimmesdale with all the malevolence of Satan.

The minister's life is one of hypocrisy and secret remorse. "He feared but one thing—the shock to the great cause for which he stood, the shame that the revelation of his guilt would bring upon the church, the loss of his power to do good, the spectacle for the eyes of mocking unbelievers 'of

the full fraught man and best indued' proved the guiltiest. This was indeed 'another fall of man.' "—Vincent's Literary Masters.

3. Discuss the American Revolution from the aspect of its effect upon our literature.

Answer.—"The American Revolution, so far as overt acts of war were concerned, began in 1775 and was over in 1783. But its direct effect upon American literature was not restricted to those seven years. The war itself afforded just cause for a high level of thought and utterance. Its leaders were uniformly men not personally or selfishly ambitious, but actuated by a sincerely disinterested passion to benefit their country and to vindicate human rights. They were also men of education and enlightenment, not demagogues nor adventurers. Accordingly, we find, during the period now under consideration, that very little pure literature was produced in America. There were more good speeches than good writings; and our knowledge of these speeches is derived mainly from fragmentary hearsay reports, the modern art of shorthand reporting not being at that time in operation. The writings, again, are for the most part strongly political; they are important for the ideas expressed rather than for the manner of expression. They attracted, no doubt, wider attention than any previous American literary productions, but it was the attention not of critics, but of statesmen and politicians."—Hawthorne and Lemmon.

4. Name five of the foremost English writers of the Elizabethan era; five of the present time.

Answer.—(a) Spenser, Shakespeare, Jonson, Marlowe and Bacon. (b) We take this to mean recent writers. Tennyson, Dickens, Thackery, Scott and Browning.

5. Define allegory. What is the world's greatest allegory and under what circumstances was it written?

Answer.—(a) An allegory is a "story in the form of a metaphor, told to convey a truth or lesson and worked out in detail."—Spalding's Rhetoric. (b) Pilgrim's Progress is one of the world's greatest allegories. It was begun while Bunyan was in prison, whither he had been sent on account of his religious views.

6. With regard to one of the following, state authorship, subject matter, time when written: Sir Roger de Coverly Papers, Childe Harold, Vision of Sir Launfal.

Answer.—Sir Roger de Coverly Papers, Addison, eighteenth century, series of essays on country life, describing a typical country gentleman, his friends and servants. Childe Harold, a poem by Byron, 1812-1816. A romance, half biographical account of his journeyings.—[Johnson.] Vision of Sir Launfal, Lowell, a poem founded on the legend of the Holy Grail. Written in 1845.

7. Who was Sir Thomas Moore; John Ruskin; Helen Hunt Jackson?

Answer.—Sir Thomas Moore, English writer, author of Lalla Rookh. John Ruskin, English writer on art: author of Sesame and Lilies, Fors Clavigera, King of the Golden River, etc. Helen H. Jackson, American writer; author of Ramona.

8. What is mythology? Name at least three famous poems having to do with mythological personages.

Answer.—Mythology, a study of the fables, legends or traditions as to their origin, early history, gods, etc., of a nation.—[Webster's Dictionary.] Beowulf, Tennyson's Idylls of the King, Longfellow's Hiawatha.

9. With regard to Lowell and Goldsmith, state whether you think the fame of each in literature rests upon the work he has done in prose or the work he has done in poetry and give reasons for your answer.

Answer.—Lowell, prose; Goldsmith, poetry. Goldsmith has written only one work of prose that has survived the test of time, The Vicar of Wakefield, while his poetry is known to every schoolboy. Lowell has written some great poetry, but most of his poems lack finish, while he is recognized as one of our greatest critics and political essayists.

10. Name five works of fiction that you consider suitable for use in elementary schools.

Answer.—Black Beauty, Christmas Carol, Man Without a Country, Uncle Tom's Cabin, The Spy.

DECEMBER, 1906.

1. Give the approximate dates and state the character of American literature of the Revolutionary period.

Answer.—See November list.

2. State the period and nature of the following publications and name one famous editor of each: Spectator, Liberator, Atlantic Monthly.

Answer.—Spectator, a periodical publishing essays in 1711; editor, Addison. Liberator, an anti-slavery paper, published in 1831 by William Lloyd Garrison. Atlantic Monthly, published in 1857; editor, Lowell; devoted to literature.

3. Discuss either Evangeline or Hiawatha as to (1) time in the author's life when written, (2) subject matter, (3) meter, (4) reasons for popularity.

Answer.—(1) Evangeline was written at "the climax of Longfellow's contemporary popularity and may be regarded as the principal bulwark of his fame." [Vincent.] (2) It is a dramatic story of the expulsion of the French settlers from Acadia, their wanderings, and Evangeline's search for her lover. (3) The meter is dactylic hexameter. (4) It possesses heart interest. Its characters are types. Evangeline "is the incarnation of beauty, devotion, maidenly pride, self abnegation. So, too, of the other characters—Gabriel, old Basil, Benedict; each has that added strength which a character conceived dramatically is bound to have if it shall prove typical as well." [Vincent.]

4. Do you consider King Lear or Macbeth the greatest tragedy? Why?

Answer.—The answer to this would depend upon the personal preferences of the applicant. Hazlitt says: "Macbeth (generally speaking) is done upon a stronger and more systematic principle of contrast than any other of Shakespeare's plays. It moves upon the verge of an abyss and is a constant struggle between life and death. The action is desperate and the reaction is dreadful. It is a huddling together of fierce extremes, a war of opposite natures which of them shall destroy the other. There is nothing but what has a violent end or violent beginning." He says also of King Lear: "It is, then, the best of Shakespeare's plays, for

it is the one in which he was the most earnest. He was here fairly caught in the web of his own imagination. The passion which he has taken as his subject is that which strikes its root deepest into the human heart, of which the bond is the hardest to be unloosed and the cancelling and tearing to pieces of which gives the greatest revulsion to the frame."

5. Mention two English books which have been written about American manners and customs; one American book written about English manners and customs.

Answer.—(a) American Notes and Martin Chuzzlewit, by Dickens. The Virginians, by Thackery. (b) English Traits, by Emerson.

6. Discuss Bryant's life and character and show how his temperament influenced his poetry.

Answer.—William Cullen Bryant was born in Cummington, Mass., 1794. He began to write verse at ten years of age, and Thanatopsis was composed in his eighteenth year. Bryant studied law, and after practicing ten years gave up that profession for literary and editorial pursuits. He was for many years connected with the New York Evening Post. He wrote much prose, but will be remembered for his poetry alone. He was "quiet, prim, grave, reticent, slender." He was formal and accurate, never very emotional. He was the poet of the lakes, rivers, forests, mountains and prairies of his own country. He described what he himself saw, and his emotions were always genuine. Simplicity, clearness and vigor marked his poetry.

7. Who wrote My Study Windows; The Chambered Nautilus; Daniel Deronda; The Vision of Sir Launfal; The Faery Queene; Rob Roy?

Answer.—My Study Windows, by Lowell; Chambered Nautilus, by Holmes; Daniel Deronda, by Eliot; Vision of Sir Launfal, by Lowell; Faery Queene, by Spenser; Rob Roy, by Scott.

8. Give two reasons why every American should be familiar with the life and works of William Dean Howells. What one of his works is autobiographical?

Answer.—(a) "He was the first western writer to take the position as recognized leader at the east. He is with-

out an equal among his English speaking contemporaries as to some of the most attractive literary graces." [Higginson and Boynton.] (b) Suburban Sketches.

JANUARY, 1907.

1. Give a definition of literature. With regard to each of the following, state whether or not you consider it literature, and why: The speeches of William McKinley; the Book of Isaiah; the Records of the Proceedings of Congress.

Answer.—Literature is the record of the thoughts, of the feelings and of the acts of a people. Literature deals with universal, ideal, emotional life. A few of the speeches of William McKinley may be classed as literature, such as the one he made the day he was assassinated. The Book of Isaiah is literature, because it complies with the definition given above. The Records of the Proceedings of Congress are not literature, although some of the speeches recorded therein are literature.

2. Mention four of Whittier's poems that you have read and give a brief outline of one of them.

Answer.—Answers will differ with the experience and taste of the applicants. The Barefoot Boy, Snow-Bound, In School Days, Among the Hills.

The Barefoot Boy is a beautiful poem, reflecting much of the experience of Whittier himself as a boy. It tells many of the interesting things a barefoot does, knows and enjoys. It shows a breadth of detail of what a boy may learn through observation and by communion with nature, and pictures the real joy and bliss of boyhood in the country.

3. Whose literary reputation was made by The Man Without a Country; Looking Backward; The Battle Hymn of the Republic; Their Wedding Journey; Thanatopsis?

Answer.—Edward Everett Hale; Edward Bellamy; Julia Ward Howe; William Dean Howells; William Cullen Bryant.

4. State some suggestions you would offer to pupils upon the value and method of use of periodical literature.

Answer.—By periodical literature we mean the litera-

ture of current magazines. Pupils should not be encouraged to read much in this direction, for the reason that the standard literature used as classics in our grammar grades and high schools are so much better calculated to inculcate right habits and correct tastes in reading. However, advanced students, say of the high school, may be encouraged to keep track of the best periodical literature by being required to give at stated times reviews of certain articles assigned to be read.

5. Name two American scientists and three American historians and mention one work of each.

Answer.—Scientists: Louis Agassiz (1807-1873); "Methods of Study in Natural History." John Fiske (graduated from Harvard 1864); wrote "Outlines of Cosmic Philosophy," as well as other scientific works and several historical works. American historians: George Bancroft; "The History of the United States." William H. Prescott; "Conquest of Mexico." John Lathrop Motley; "The Rise of the Dutch Republic."

6. Select two characters from the following, tell in what play they are found and characterize each briefly: Marc Antony, Portia, Falstaff, Ophelia.

Answer.—Marcus Antonius (Marc Antony) is a leading character in "Julius Caesar" and "Antony and Cleopatra." There is a Portia in "Julius Ceasar," also in "The Merchant of Venice." Marc Antony is a shrewd politician, thinking seldom of his friends and always of himself. In his mental make-up the outer traits of character predominate over the inner; he lives in a world of deeds rather than in one of ideals. Although controlled by selfish motives, he is able to recognize the worthy. For instance, his final tribute to Brutus. The strong attachments of which he was capable would, he thought, prove of use to him. The Portia of "Julius Caesar" is a woman of marked strength. Her life is one of stoic devotion to that of her husband's. She inflicts a painful wound upon herself as a proof of her power to bear any of the trials weighing down Brutus and as a mark of her constancy to him. When she feels convinced of Brutus' ultimate failure, she dies by swallowing coals of fire, enduring unspeakable tor-

tures in a manner becoming a daughter of the famous Cato.

7. Which of Hawthorne's novels do you consider the best? Why? Which do you consider the best adapted to school study? Why?

Answer.—"The Scarlet Letter" is Hawthorne's greatest production. James T. Fields, his publisher, said it was "the greatest book of the age." "Twice Told Tales" is perhaps better adapted to school study, because of the charm of the language and the historical setting. "The Wonder Book," for pupils in the lower grammar grades, has no superior.

8. Name two prominent literary figures of England in the time of Elizabeth; two in the time of Cromwell; two in the present time.

Answer.—In the time of Elizabeth (reign, 1558-1603): Shakespeare (1564-1616), Edmund Spenser (1552-1599), Francis Bacon (1561-1626). In the time of Cromwell: John Milton (1608-1674), Samuel Butler (1612-1680). In the time of Victoria and King Edward: Alfred Tennyson (1809-1892), Bobert Browning (1812-1889), Charles Darwin (1802-1882), John Ruskin (1820-1899). Those now living: Kipling, Austin, and Swineburn.

FEBRUARY, 1907.

1. What methods do you believe best adapted to the study of literature in the grammar schools?

Answer.—Pupils in these grades do not need to be taught much of the history of literature, yet they need to know the general outline of the history of literature in the seventh and eighth grades. The best way to give this information is in connection with their study of the English classics. The best, the most fruitful, method here is through the reading of classics—some as home reading and some as class work in school.

2. Trace in early American literature some influences of its English origin.

Answer.—As practically all the scholars and literary people of colonial and Revolutionary days came from England or had been educated there, it was natural that

the influence of English literature would be quite noticeable. On the other hand, the separation gave rise to new ideals and new types of literary expression.

3. Name two American writers who exerted a strong influence for the abolition of slavery. How?

Answer.—John Greenleaf Whittier, through his poems; William Lloyd Garrison, through his editorials in "The Liberator"; Harriet Beecher Stowe, in her "Uncle Tom's Cabin."

4. What do you understand the term "Literature" to include? What benefit have you derived from the study of literature?

Answer.—See answer to first question in the preceding list, for January, 1907. The answers to the second part of the question would differ according to the applicant.

5. What qualities of Longfellow's poetry do you particularly admire? Mention two of his early poems: two of his translations.

Answer.—His deep and comforting sympathy; his appeal to the highest and truest emotions; his love for children. Two of his earlier poems: The Reaper and the Flowers, and The Psalm of Life, published in 1839. Two of his translations: Some of Lope de Vega's Sonnets, and The Divine Comedy of Dante. His last poem, written only a week before his death, was "Bells of San Blas."

6. To what class of fiction does each of the following books belong: The Spy, Romola, The House of Seven Gables, Tom Sawyer, The Murders in the Rue Morgue? Who wrote each of these books?

Answer.—The Spy, by James Fenimore Cooper, is an historical novel; Romola, by "George Eliot" (Mrs. Mary Ann Evans-Cross), historical, in the sense that it embodies the author's study of the life of Savanarola; The House of the Seven Gables, by Nathaniel Hawthorne, is a novel of sombre hue; Tom Sawyer, by "Mark Twain" (Samuel L. Clemens), is a humorous story.

7. Select five names from the following and state for writings in what department of literature each is famous: Louisa May Alcott, Edmund Clarence Stedman, Francis Parkman, John Burroughs, James Cowper, Jonathan Edwards, Mark Twain.

Answer.—Louise May Alcott, for "Little Women" and "Little Men," books for young people; Edmund Clarence Stedman for his poetry and his essays; Francis Parkman, as an historian; Jonathan Edwards, as a philosopher and metaphysicist; Mark Twain, as a humorist.

8. State your reasons for assigning to Nathaniel Hawthorne a prominent place in American literature.

Answer.—For his analytical insight into all that is quaint, delicate, and suggestive in the English tongue; his originality, his charming style, and moral insight, which put him in a class by himself. His romances are unequalled in our language.

9. Write briefly upon the personal characteristics of one of the following: Samuel Johnson, Thomas Carlyle, Walt Whitman.

Answer.—"Thomas Carlyle (1795-1881) was a man unlike all other men of letters; so out of sympathy with the epoch in which he lived that he is called the censor of his age; so versatile in talent that he may be classed among philosophers, or historians, or biographers, or essayists."

10. Is it essential that every teacher of literature should be familiar with Shakespeare? Why, or why not?

Answer.—Yes, at least quite desirable. The Shakespearean style is worthy of close study; his versatility was the most extensive of all writers; so much from Shakespeare is to be found in current literature that it is very inconvenient and embarrassing to be ignorant of Shakespeare.

MARCH, 1907.

Answers by Prof. H. D. Grindle, Lima College, Lima, Ohio.

1. Write briefly upon the travels of Washington Irving and mention at least four of his contributions to literature.

Answer.—Irving, at twenty-one years of age, was sent to Europe by his brothers for the benefit of his health. He had to be helped on board the boat, and the captain remarked, "There's a chap who will go overboard before we get across." Landing at Bordeaux, he went on to Genoa, then to Sicily, and came back to Rome. Paris and London were visited, and then he returned to New York.

In 1815 ne again went to England and during his stay met Sir Walter Scott. In 1826 he went to Spain and as a result wrote "Life of Columbus," "Conquest of Granada" and "Alhambra." He also wrote The Sketch Book and Knickerbocker's History of New York.

2. What can you say of the life and poetry of Anne Bradstreet? How was she considered by her own generation?

Answer.—Anne Bradstreet, daughter of one Puritan governor and the wife of another, reared a large family and gave forth the first volume of poetry from a New England pen. Her generation was lavish in praise of her, calling her "The Tenth Muse."

Her poems were written in the conventional and exaggerated style then in vogue in England.

3. Discuss Concord, Mass., as a literary center.

Answer.—Concord, Mass., is notable for having been the home of a distinguished coterie of writers and thinkers, including Emerson, Thoreau, A. Bronson Alcott, Louise M. Alcott, Hawthorne and Channing.

4-5. Give the authorship and a brief summary of the subject matter of any two of the following: The Vision of Sir Launfal, The Prisoner of Chillon, Marmion, L'Allegro; any one of The Idylls of the King.

Answer.—The Vision of Sir Launfal was written by Lowell; The Prisoner of Chillon by Bryon; Marmion by Scott; L'Allegro by Milton, and The Idylls of the King by Tennyson. For a summary of Sir Launfal the applicant may give an account or description of his journey and state the object of it. Tell of his disappointment and of surprise upon his return. In L'Allegro we have a life picture which the applicant can fully set forth. It may be compared with that found in Il Penseroso.

6. For what historical work is George Bancroft most noted? John Lothrop Motley? William Prescott?

Answer.—Bancroft is most noted for his History of the United States. Motley for his Rise of the Dutch Republic. Prescott for his Ferdinand and Isabella, and Conquest of Mexico.

7. Show by reference to American prose that patriot-

ism has played an important part in the literary inspiration of the country.

Answer.—The following show patriotism in American prose: Speech of Patrick Henry; The Federalist; Webster's Orations; Wendell Phillips' Orations; Sumner's Speeches; Franklin's "Liberty and Necessity;" Hale's "The Man Without a Country."

8. Mention your favorite American novelist and tell why you like his works best.

Answer.—Answers to this question will, of course, differ. Hawthorne is generally considered the best, both in subject matter and literary merit. Some favor Howells, who is the greatest living American novelist.

9. Show how you would exemplify correlation of studies in the teaching of "Evangeline."

Answer.—Though Evangeline is considered the most beautiful and the most touching story yet told in American verse, yet "its charm was greatly increased by the skill with which the natural scenery of America, and our varying seasons, were used to furnish a background before which the simple figures of the story moved with fidelity to life."

The embarkation in Acadia, the landing, the sympathetic power exhibited in the poem, the beautiful tribute to woman's constancy, the excellent descriptions, and the magic power of the proper names, all furnish good material for correlation in history, geography, and rhetoric.

10. Indicate by quotation that you are familiar with at least one of Shakespeare's plays.

Answer.—(1) "Fair is foul and foul is fair."

(2) "If it were done when 'tis done, then 'twere well it were done quickly."

(3) "I dare do all that may become a man; who dares do more is none."

(4) "Screw your courage to the sticking place, and we'll not fail."

(5) "Banquo, thy soul's flight,
If it find heaven, must find it out tonight."

(6) "This without all remedy
Should be without regard."

(7) "After life's fitful fever he sleeps well."—Macbeth.

APRIL, 1907.

Answers by the Editor.

1. Why did American literature of the Colonial Period contain no writings of a light or humorous nature? Who was the first American humorist?

Answer.—The colonists had serious problems to solve. Literature reflects the thoughts of a people. Perhaps the first American humorist was Artemus Ward. The questioner may have had something else in mind, but Ward was really our first great humorist.

2. What effect did the Norman Conquest have upon the language of England?

Answer.—The effect of the Norman Conquest, 1066 A. D., was to introduce the Norman French element into the language. It also introduced the custom of borrowing words; introduced many generic, or class names; gave new life to language and a higher and wider scope to thought; gave us our first synonyms. (See Williams's "Didactic Outlines of Grammar," p. 27.)

3. Name three of Longfellow's long poems; three of his short poems; two of his prose writings; two of his translations.

Answer.—"Courtship of Miles Standish," "Hiawatha," and "Evangeline" are three of Longfellow's longer poems. "Hyperion" and "Outre Mer" are prose works. Two of his translations are of Dante's "Divine Comedy," and from the Spanish "Coplas de Manrique."

4. Discuss each of the following with regard to his relation to politics: Edmund Burke; James R. Lowell.

Answer.—Edmund Burke (1729-1795), although he never held office, was for years the brains of the Whig party in England. He labored to limit the exercise of the royal prerogative, which George III with the assistance of the Tories, was determined to exercise. He saw the dangers threatening England from all quarters and tried to avert them. He was friendly to the American colonies because he believed them right and the king wrong. He took a similar interest in India, and fought hard to impeach Warren Hastings, but Hastings was acquitted. He was essentially moderate and conservative.

James Russell Lowell (1819-1891) wrote a number of poems and prose compositions on political subjects. "The Biglow Papers," "The Present Crisis" and some of his editorials in The Atlantic Monthly and North American Review have a strong political bearing. He served as Minister to Spain under President Hayes, 1877-1880, when he was transferred to England as Minister to that country.

5. What is meant by "realism" in fiction?

Answer.—By "realism" in fiction we mean the use of plain, ordinary people and commonplace deeds as the basis of fiction in such a way as to set forth the real habits, customs, ideals, and practices of a people. William Dean Howells and Henry James, both still living, are examples of realists among our novelists.

6. Name one American work, together with the name of its author and the department of literature to which it belongs, relating to each of the following: The Dutch in the New World; the superstitions of early New England; the American Indian; early days in California; the negro.

Answer.—Knickerbocker's History of New York, by Washington Irving; The Ecclesiastical History of New England, by Cotton Mather, a religious work; The Oregon Trail, by Francis Parkman, an historical work, details life among the Indians; Ramona, by Helen Hunt Jackson, fiction; Up from Slavery, by Booker T. Washington, autobiographical.

7. What was the nature of the experiment in which Hawthorne participated at Brook Farm? Which one of his books reveals his views with regard to this experiment?

Answer.—He thought it would be a good place to take his bride and make it their home, but the project was not a success and he went to live in the Old Manse, where he found happiness and success. "Blithedale Romance" grew out of his brief experience at Brook Farm.

8. What is your favorite novel? How has it helped you?

Answer.—Answers will differ widely.

9. What is an epic poem? What great epic did John Milton write?

Answer.—An epic poem is one in which some real or supposed hero is presented in a strong, elevated style, to set forth a great ideal. "Paradise Lost."

10. State one fact of literary interest about three of the following: Goethe, Plato, Chaucer, Thoreau, R. L. Stevenson.

Answer.—Goethe (1749-1832), was a celebrated German author who gave us "Faust." Plato (429-347 B. C.) was a great Greek philosopher. Chaucer (1328-1400), the "Father of English Poetry," wrote "The Canterbury Tales." Henry David Thoreau, an American (1817-1862), write "Walden." Robert Louis Stevenson, an English writer (1850-1894), wrote "Dr. Jekyll and Mr. Hyde."

MAY, 1907.

1. What is literature? Name three works of literature written in ancient times.

Answer.—For a definition of Literature, see the list for January, 1907, first question. As to three works written in ancient times, the answers might differ widely. Anything written prior to 476 A. D. would comply with the requirement, and in any language. The Bible, the Koran, Zend Avesta, Book of the Dead, the works of Caesar, Cicero, Pliny, Plato, Aristotle, Homer, etc.

2. Tell what you can of the character and value of the writings of Cotton Mather and Jonathan Edwards.

Answer.—Cotton Mather (1663-1728), a famous Congregational clergyman, wrote Wonders of the Invisible World, Memorable Providences Relating to Witchcraft, The Armour of Christianity, etc. His writings were religious and theological. Jonathan Edwards (1703-1757), a Congregational clergyman and a philosopher, wrote Freedom of the Will, The Religious Affections, and many sermons.

3. Whom do you consider the first American poet of importance? Give reason. Name one of his poems.

Answer.—Henry Wadsworth Longfellow, because prior to the 19th century America had produced no great poet. He stands today as one of the half dozen greatest poets produced by this country. Evangeline, etc. **See answer to question 3, April, 1907.**

4. Name, with their authors, five classics that belong to the literature of American patriotism.

Answer.—Webster's Bunker Hill Oration, Lincoln's Gettysburg Speech, Hawthorne's Grandmother's Tales, Longfellow's Paul Revere's Ride, Charles Buchanan Read's Sheridan's Ride.

5. What five men are frequently called the great American poets? Quote at least five lines from the writings of one of them to show his fondness for nature.

Answer.—Longfellow, Whittier, Lowell, Bryant, and Holmes. Poe, Whitman, and Lanier might well be added to the list. From Bryant these lines, from "A Forest Hymn":

"The groves were God's first temples. Ere man learned
To hew the shaft, and lay the architecture,
And spread the roof above them—ere he framed
The lofty vault, to gather and roll back
The sound of anthems; in the darkling wood,
Amid the cool and silence, he knelt down,
And offered to the Mightiest solemn thanks
And supplication."

6. Why was Macaulay "a great popularizer of history"? Where is he weak as a historian?

Answer.—Macaulay did much to popularize history through his entertaining style, his positiveness, and his ability to speak entertainingly and convincingly on historical subjects. His force as a speaker influenced the style employed in his writings. Perhaps his weakness as a historian is his lack of a profound view of underlying causes, that large intellectual interpretation of events, which constitutes the philosophy of history.

7. In what language did King Alfred write? Chaucer? Cervantes? Dante? Plato?

Answer.—King Alfred wrote in Anglo-Saxon. Chaucer write in English. Cervantes wrote in Spanish. Dante wrote in Italian. Plato wrote in Greek.

8. Mention two living American poets, two living American novelists, one living American humorist. Name one work of each.

Answer.—Two living American poets are Lanier and Riley; two living American novelists are William Dean Howells and Frank R. Stockton; one living American humorist is "Mark Twain" (Samuel L. Clemens).

JUNE, 1907.

1. State facts of importance concerning the personal life of Longfellow and mention the name and author of at least one prominent biography of the poet.

Answer.—Longfellow's home life was almost ideal. Those who knew him best testify that he was lovable, companionable, gentle, sympathetic, even-tempered, happy, and always wanting to make others happy. He loved children, and his own children found in him a constant and true companion. Edmund Clarence Steadman. Samuel Longfellow, and George W. Curtis have written splendid biographies of Longfellow.

2. Name at least three writers of the Revolutionary Period of American literature and tell something of the character of the literature of that Period.

Answer.—(1) Benjamin Franklin (1706-1790), Charles Brockden Brown (1771-1810), Philip Ferneau (1752-1832). (2) Much of the literature of that period was devoted to the cause of liberty and independence. It had a tendency also to cultivate a disposition on the part of American schools and scholars to originate and not rely upon the literature of England. Such a spirit developed a Washington Irving and ultimately an American type of literature.

3. What qualities distinguish Poe from any other American fiction writer?

Answer.—Perhaps his utter fearlessness and his weird, melancholy style, as in "The Raven," are his typical characteristics.

4. Make a list of Lowell's most important long poems and briefly analyze one of them.

Answer.—The Vision of Sir Launfal, A Fable for Critics, Biglow Papers. In The Vision of Sir Launfal we have the

story of a haughty knight who goes forth to find The Holy Grail. As he starts out he tosses with impatience a coin to a beggar at the wayside. After fruitless search for the cup he returns, but finds that it is not necessary to go on long journeys to find opportunity to serve the Master, so concludes that

"'Tis heaven alone that is given away,
'Tis only God may be had for the asking;
No price is set on the lavish summers.
June may be had by the poorest comer."

"One day, with life and heart,
Is more than time enough to find a world."

5. What is a pseudonym? Name some famous American authors who have written under pseudonyms.

Answer.—A pseudonym is a pen name, or **nom de plume,** other than the real name of the author. "Mark Twain" is the pseudonym of Samuel L. Clemens. "Ik Marvel" is the pseudonym of Donald G. Mitchell. "Timothy Titcomb" was the pseudonym of Dr. Josiah G. Holland. There are many more.

6. To what department of letters do most of the writings of Mark Twain belong? Name two of his books.

Answer.—Mark Twain is a humorist and his writings are distinct contributions to American humor. "Roughing It," "The Tramp Abroad," and "Following the Equator."

7. Quote at least eight consecutive lines from one of Whittier's poems.

Answer.—The following is from one of Whittier's poems:

"We shape, ourselves, the joy or fear
Of which the coming life is made,
And fill our future's atmosphere
With sunshine or with shade.
The tissues of the life to be
We weave in colors all our own
And in the field of destiny
We reap as we have sown."

8. Define each of the following: Autobiography, blank verse, ode.

Answer.—An autobiography is an account of one's life

written by himself, such as Franklin's Autobiography. Grant's Personal Memoirs is also really an autobiography. A blank verse is poetry without rhyme, usually iambic pentameter. An ode is a lyric poem, or one that may be set to music.

9. Select one name from the following list of English authors and give an adequate idea of the character of his work: Dryden, Macaulay, Dickens.

Answer.—See any standard text on English Literature. Dickens was remarkable for his keen insight into social, industrial, ethical, and educational conditions in England in the 19th century, and was wonderfully sympathetic with the common people and especially alive to the rights and needs of children. For this reason he has been called one of England's greatest educators, although he was essentially a novelist and not a teacher.

10. What plays of Shakespeare's have you read? Which do you like best? Why?

Answer.—Answers will differ, owing to experience and taste of the applicant. Many teachers would doubtless be compelled to say they had never read much of Shakespeare —"the more's the pity."

JULY, 1907.

1. Tell which of the following poets you admire most as a man, which as a poet, and why: Lowell, Poe, Wordsworth, Byron, Bryant.

Answers.—Answers will differ.

2. Quote at least five consecutive lines from any two of the following: Milton, Emerson, Whittier, Burns, Goldsmith, Holmes, Tennyson.

Answer.—Answers will differ. The following quotations are offered:

"Build thee more stately mansions, O my soul
As the swift seasons roll!
Leave thy low-vaulted past!
Let each new temple, nobler than the last,
Shut thee from heaven with a dome more vast,
Till thou at length art free,
Leaving thine outgrown shell by life's unresting sea."

—Oliver Wendell Holmes.

"All my hurts
My garden spade can heal. A woodland walk,
A quest of river-grapes, a mocking thrush,
A wild-rose, or rock-loving columbine,
Salve my worst wounds."—Ralph Waldo Emerson.

3. Tell upon what the literary value of a work of history depends and name some works on history that stand high as literature.

Answer.—Adherence to the truth, impartiality of the author, an easy, flowing style, suited to theme narrated. Macaulay, Gibbon, Greene, Hume, Parkman, and Prescott.

4. Why should every student of literature know something of "rare Ben Jonson"? Tell something of his personal characteristics.

Answer.—Because Ben Jonson had a striking individuality, and there is just one such writer. His dramas show a sharp contrast to those of his contemporaries. He set himself to convert the drama to classicism. His style, his wit, his lyric gift, his great scholarship, all mark him as a man to be carefully studied.

5. Name three Americans and two Englishmen who have been both statesmen and litterateurs.

Answer.—Americans: Franklin, Horace Mann, James G. Blaine, and many others could be named. Englishmen: Burke, Gladstone, Disraeli.

6. Define each of the following and name a production which exemplifies it: Drama, lyric poetry, realistic fiction.

Answer.—Drama is a composition, either in prose or poetry, giving in quick action some event or situation in real life, leading to a comical, tragic or surprising close, and so presented as to be possible to stage. Lyric poetry is poetry that may be set to music and usually presents the personal feelings or emotions of the author. Realistic fiction is that which deals largely with realism rather than idealism.

7. State whom you consider the greatest American novelist; whom you consider the greatest living American novelist. Defend your position in each case.

Answer.—Answers will differ.

8. Tell what you can of literature in America before the Revolution.

Answer.—Prior to the Revolutionary Period in American literature, the writings of the few who engaged in literary pursuits were chiefly religious or philosophical, with the exception of such writers as Franklin, who was a practical scholar, statesman, diplomat, and philosopher.

9. Who are our foremost nature writers of today? Indicate some of their material that is adapted to school use.

Answer.—John Burroughs—"Birds and Bees"; William J. Long—"Wilderness Ways," "Ways of Wood Folk," etc.; Seton Thompson—"Call of the Wild."

10. Locate five of the following characters: Portia, Sam Weller, Simon Legree, Tom Sawyer, Ramona, Arthur Dimmesdale, Uncas.

Answer.—For "Portia," see answer to question 6, January, 1907. "Sam Weller" is to be found in Dickens's "Pickwick Papers." "Simon Legree" is a character in Harriet Beecher Stowe's "Uncle Tom's Cabin." "Tom Sawyer" is a character in a book by that name by Mark Twain. "Ramona" is a character in a book by that name by Helen Hunt Jackson.

THEORY AND PRACTICE.

Answers by W. F. Lady, Mansfield, O.

AUGUST, 1906.

1. Give the etymology and an acceptable definition of the word **pedagogy.**

Answer.—Pedagogue is derived from the Greek paidagogos, from (pai(d-)s, child, + ago, lead. It originally meant a slave who attended the children to school, the theater and sometimes instructed them. Pedagogy is the science of teaching.

2. What powers of the mind are most active in the early years of school life? In the later years of school life? Accordingly, should primary teaching be chiefly objective or subjective?

Answer.—In the earlier years of the child's school life the perceptive powers of the mind are most active; in the later years the conceptive and generalizing powers. Primary teaching should be chiefly objective.

3. Illustrate the principle of self-activity in education.

Answer.—In infancy the child learns to talk, to sing, to write, etc., by imitative action, but in later years he acquires skill in these acts, only through voluntary effort, guided by imagined ideals and ends. Through self-activity alone are the higher planes of thinking, reasoning and judgment attained.

4. How do you distinguish sensation from perception?

Answer.—Sensation is the conscious state arising from the action, under stimulus, of a sense organ. Sensation is an element of perception. Perception may be regarded as a complex of sensations. Perception is the faculty through which knowledge of the external world is gained or acquired by means of the senses.

5. Define the inductive and deductive methods of reasoning.

Answer.—Induction is that mental process which begins with individual facts and by inference reaches a general truth or principle. Deduction begins with a general truth or fact and by reasoning deduces included truths or facts. —See White's Art of Teaching, p. 75.

6. What are the "industrial branches"? What share of attention do you believe they should receive in the curriculum of a graded school?

Answer.—The "industrial branches" are those which apply directly to industrial or commercial life; such as arithmetic, commercial geography, bookkeeping, agriculture. As to the attention they should receive in the curriculum, answers will differ. Some educators would give them the main part of the course of study, while others would give them prominence only in special courses. It is fair to assume that the industrial branches should not be emphasized to such extent as to exclude cultural subjects.

7. What should be the true object of all punishment?

Answer.—The true object of punishment should be, to reform the wrong-doer by impressing the sense of guilt, and leading him to see that wrong-doing ends in pain or privation; to restrain others from doing wrong, not only from the motive of fear, but also by leading them to condemn the wrong deeds in their own minds, and realize the results that must naturally follow the violation of law and order.

8. Mention at least two important results to be secured by written work in any branch of study.

Answer.—(1) To train the pupil in the skillful use of the written forms of the language; (2) to train him to express his knowledge in writing.

9. How are school board members chosen in Ohio? What persons are eligible for the office?

Answer.—In the city, village, township, and special school districts of Ohio, the school board members are chosen at large by the qualified electors of the districts, except in those cities of over 50,000 inhabitants, which according to Section 3897, decided to have a representative board composed of members chosen in sub-districts. As

to eligibility, no special qualifications are required by law. A man who can neither read nor write may be chosen to the board.

10. Mention three books on education (one of them upon the history of education) with which you think a teacher should be familiar, and give your reasons.

Answer.—Quick's Educational Reformers, James's Talks to Teachers, White's Art of Teaching. No one should take up the work of teaching without acquainting himself as liberally as possible with the history of education, its underlying principles, and the most approved methods of conducting school work. Those having charge of education, as in most other things, may derive much benefit and help, from a knowledge of what has been said and done by those engaged in it, past and present.

SEPTEMBER, 1906.

1. Distinguish between physical and mental facts.

Answer.—A physical fact is one relating to actual physical existence, while a mental fact is a fact of consciousness.

2. What was the Socratic method of instruction? Can its principle be properly employed by present-day teachers?

Answer.—The Socratic method of instruction consists not in telling what the instructor knows, but in leading the student to discover the truth through his own energies, by asking him such questions as will call up previous experiences and draw him out to a free expression of his own ideas. The new conclusions constitute the knowledge acquired. This method can not be exclusively employed by the present-day teacher. In the first place, not everything can be developed; second, it is extremely difficult; third, intellectual treasures of the past with which the present school is concerned lie locked up in books.

3. State and illustrate the influence of the will upon attention.

Answer.—The will determines the object upon which the mental faculties are to be focused. The intellect does not attend to an object simply because it is attractive, but

because the will says that the mental energies must go that way. This is active or voluntary attention and is maintained at a heavy expense of energy. In the schoolroom it is necessary to reinforce the active attention as much as possible from other sources.

4. What do you consider the ideal situation with reference to light in the schoolroom? Heat?

Answer.—When the schoolrooms are oblong the light should come from one side, the pupils being so seated as to get the light from the left. The windows should reach to the top of the room and extend to within 3 feet 4 inches of the floor. The minimum of window space should form one-fourth to one-fifth of the floor space. The ceilings should be white or light cream color. Ecru or greenish tint shades rolling from top or bottom afford the best means of controlling the light.

The temperature should range from 64° to 74° Fahr. The problems of heating and ventilating are closely related. For a comprehensive discussion of these subjects, see Dutton's School Management, Chapters IV and V, and Report of the Committee of Twelve, Appendix M.

5. Explain the difference between the analytic and synthetic methods of teaching.

Answer.—"In the analytic method, knowledge is taught by beginning with a whole and proceeding by an analytic process to its elements or constituent parts. In the synthetic method knowledge is taught by beginning with the elements or parts and proceeding by synthesis to the whole."—White.

6. Who originated the kindergarten? What is the object and nature of kindergarten instruction?

Answer.—Froebel originated the kindergarten. The object and nature of its instruction may be stated in his own words: "To take the oversight of children before they are ready for school life; to exert an influence over the whole being in correspondence with its nature; to strengthen their bodily powers; to exercise their senses; to employ the awakening mind; to make them thoughtfully acquainted with the world of nature and of man; to guide the heart and soul in the right direction and to lead them to the origin of all life and to union with Him."

7. When would you first introduce the pupil to fractions? What method of instruction would you employ?

Answer.—The idea of a fraction should be developed objectively in the first and second years. The exercises should include the division of objects into equal parts, and later the division of groups of objects into equal parts and naming the parts. Then the exercise should pass to the division of concrete numbers and later abstract numbers. Fractions should at first be expressed in words and later in figures. (See White's Art of Teaching, p. 250.)

8. What value do you place upon mental arithmetic? Why?

Answer.—Exercises in mental arithmetic are valuable in analytic training. It need not be taught as a separate branch. All approved texts in arithmetic should contain an abundance of oral exercises aside from those which are introductory to written work.

9. What is the minimum length of the school year in Ohio?

Answer.—The school year in Ohio begins September 1 and ends August 31. The minimum of time a school must continue during a year is eight months.

10. Make a list of five pedagogical works that you would recommend to a prospective teacher.

Answer.—Answers will differ, but the following are well recommended: McMurry's The Method of the Recitation; White's School Management; Kirkpatrick's The Fundamentals of Child Study; O'Shea's Education as Adjustment; Badgely's The Educative Process.

OCTOBER, 1906.

Answers by Dean Henry G. Williams, Athens, O.

The first five questions refer to "Rational Living," by Henry Churchill King.

1. To form the subjects of the discussions contained in "Rational Living," what four great inferences does the author draw from modern psychology?

Answer.—Life is complex; man is a unity; will and action are of central importance; and the real is concrete.

2. Change the educational maxim, "Make your instruc-

tion interesting," so that it will be in accord with a newer pedagogical aim.

Answer.—"Instruct in such a way that an interest may awake and remain active for life." (P. 13.)

3. With regard to the reception of new knowledge, what conditions are essential to intellectual growth?

Answer.—The power to attend or give attention; the power to ignore; the power to select or discriminate; the power to anylyze and classify; the power to assimilate what is selected as the truth.

4. What paradoxical elements are involved in the development of character? What solution of this paradox is found in the teaching of Christ?

Answer.—(a) The paradoxes of dispositions or temperaments. In making choice between a right and a wrong, we must train ourselves to make our deliberation habitual, yet decide promptly when the evidence is all in. Some people find it almost impossible to decide anything, while others are prone to fly at conclusions. Better walk to our conclusions than fly to them or stand still. Then we have the paradox of the considerate and the deliberate temperaments. One needs both dispositions. (Pages 26-38.) (b) The paradox of saving the life by losing it—denying the narrow, merely individual self, like the grain of wheat in the ground, to rise to the life of the larger self.

5. What analogy exists between the methods by which the scientist solves the problems of nature and those by which man works out the complexities of his own life?

Answer.—The growth of the natural sciences has taught us these lessons: The unwearied study of minute details; patient search for the law underlying the phenomena investigated, and for the exact conditions involved; precise and persistent fulfillment of these conditions. It discards law and hence possible achievement. So man must approach the problem of his own life and purpose.

6. Illustrate perception and show how it differs from sensation.

Answer.—The power of the mind to know directly present material objects is called perception, while sensation is feeling—merely the first step in perception.

7. How would you teach reading to beginners; to an eighth grade class? What psychological reasons underlie the difference in the methods employed?

Answer.—(a) There are many methods in use in the teaching of reading to beginners. See Williams's "Course of Study for Elementary Schools" for a discussion of the psychology of learning to read. A very good method is a combination of the word method and sentence method, not teaching the letters until perhaps the third month and then incidentally and not alphabetically. (b) An eighth grade class should not need to be taught how to read. This should be mastered during the first five years in school. After this, literature, a reading of the classics, should take the place of mere reading.

8. State and illustrate the difference between remembering and recollecting. Why do we remember anything that we try to forget?

Answer.—We remember without an act of the will, but to recollect, is to recall through an act of the will. By trying to forget a thing we are likely to deepen the impression it has made upon our minds.

9. In the common school curriculum, what studies most naturally correlate with each other?

Answer.—Language, reading, spelling, and composition naturally correlate, and all really come under the head of Language. History and Geography are also very closely related. All subjects are more or less correlated with one or more other subjects.

10. Mention four cardinal points of school hygiene.

Answer.—(1) The temperature of the schoolroom should be kept equable, with a gradual reduction in the temperature near time for dismissal, to something less than 65 deg. F. (2) The ventilation of the room should be carefully attended to. (3) Such games as will give play to mind and body, and as much of the body as possible, should be played, and all games tending to very violent exercise should be avoided. (4) Damp feet and damp clothing during the quiet of study hours should not be permitted. Ample provision should be made to protect the health of the pupils.

NOVEMBER, 1906.

The first five questions are based upon "Rational Living," by Henry Churchill King.

1. State some of the paradoxes involved in character.

Answer.—See answer to question 4 in the October list. (King's Rational Living, pp. 26-38.)

2. What is the influence of fatigue upon the mental life?

Answer.—It causes many strange but significant phenomena: Color-blindness, mental weariness, involuntary movements, nervousness, hallucination, amorousness, hysterical symptoms, unsteadiness of brain, hand and body. Fatigue is intellectually and morally dangerous. (See pp. 64-78.)

3. Show the impossibility of the excuse, "I won't count this time."

Answer.—The doing of any act, be it of body or mind, makes it easier for the body or mind to do the same thing again, and by inhibition the act may become almost automatic, a second nature, the natural course to pursue. So, the first act, though apparently insignificant, may lead to others, and those to fixed habits.

4. Give in substance Dr. Corning's rules for the preservation of mental reserve power.

Answer.—(1) Avoid excessive emotion; (2) do not try to accomplish in one hour work enough for two hours; (3) avoid every species of excess which experience has proved leads to constitutional drain; (4) do not attempt to do two things at once; (5) avoid petty engagements which interfere with sleep.

5. Explain from a physiological standpoint, the author's dictum. "An ultimate message of hope is essential to the strongest living."

Answer.—Without a radiant hope and a high ideal all work would be drudgery, and would lose interest to us. If there is no joy in the doing, there can be but little relish of the fruits of one's labor. Despondency kills.

6. How would you secure and hold the attention of primary pupils? In what respect and why would your methods differ with regard to high-school pupils?

Answer.—(a) Pupils of the primary grades, especially the first and second years, are not naturally interested in their studies for the sake of acquiring knowledge or with the thought of making themselves more useful citizens. Other motives must be sought for them. Curiosity, a desire to find out what seems to them hidden or mysterious, and the interest in things rather than in subjects, must be the controlling motives to which the teacher must appeal. The older and more mature pupils become, the more they may be expected to give voluntary attention to anything tactfully presented by the teacher. (b) In the high school are students, not children, and the teacher needs to appeal to rivalry, the spirit of contest in intellectual tasks, the sense of duty, the spirit of emulation, and everything that tends to make close and consistent thinkers of the students. They have sufficient maturity of mind to make such a course not only desirable but necessary.

7. What use would you make of supplementary reading in the fifth grade?

Answer.—Several uses: (1) To supplement the regular text, if one is used in the Fifth Grade, so that the class may have greater variety of reading matter to sustain the interest; (2) To enlarge the visual vocabulary of the pupils; (3) To furnish types of literature of the highest grades; (4) To supplement the work in Geography, History, and Elementary Science.

8. Why should corporal punishment never be used in the case of intellectual shortcomings?

Answer.—Bodily pain can not cure mental disease nor hereditary shortages.

9. Distinguish between natural and artificial incentives, and give examples of both.

Answer.—"Natural incentives are those motives that attend effort and attainment as a natural result or consequence." "Artificial incentives are those rewards or incitants which are thrust between the pupil and the natural consequences of study and conduct, and thus become the immediate ends of effort," says Dr. White. **Natural incentives:** A desire for standing or rank; a desire for the approbation of equals and superiors; a desire for activity and

power; a desire for knowledge; the hope of future good; a sense of honor; a sense of duty. **Artificial incentives:** Prizes—books, medals, merit tickets; privileges—as holidays, early dismissal from school, choice of seats, etc.; immunities—exemptions from duty, tasks, etc.

10. Give the names of the following: (a) The national commissioner of education; (b) the president of Harvard College; (c) three educational journals published in the United States.

Answer.—(a) Dr. Elmer E. Brown, recently appointed to succeed Dr. William T. Harris; (b) Dr. Charles W. Eliot is president of Harvard University; (c) Educational Review, Education, The Elementary Teacher, and many other excellent journals might be named.

DECEMBER, 1906.

The first five questions are based upon "Rational Living." by Henry C. King.

1. Show that asceticism is based upon unsound principles of life.

Answer.—Asceticism may be defined as the practice of extreme rigor and self-denial in religious matters. An ascetic follows the letter of the law rather than the spirit of it, is austere, especially in the application of rules of conduct to others. Asceticism fails to recognize that conduct is an individual rather than a collective matter and that the intellectual and spiritual life has its bodily conditions that must not be ignored.

2. What does King say of the place and value of "drudgery" in human life and work?

Answer.—He points out the important fact that it is our daily task, the common duty, that is our greatest educating influence. Every child should be held to the regular performance of some task.

3. Describe Mosso's experiments and tell what they prove.

Answer.—They prove the close connection between physical and mental phenomena; that there is a close and positive connection of thought and the circulation of the blood; that the exercise of the mind draws more blood to

the brain; that the quality of the blood affects normal brain activity.

4. Explain the interrelation of attention, self control and nervous energy.

Answer.—The natural power of self control is directly proportioned to the amount of surplus nervous energy. All self control seems to involve the use of the higher brain centers, which are first affected by fatigue or any abuse.

5. State five physical conditions upon which the possession of surplus nervous energy depends.

Answer.—(1) Good health in general; (2) suitable food in proper amounts; (3) rest and recreation in suitable ratio to work; (4) temperate habits; (5) a contented mind, free from unnecessary worry.

6. State what methods you would adopt to secure regular and punctual attendance in a school deficient in these respects.

Answer.—(1) Have interesting and profitable opening exercises; (2) make school a pleasant, cheerful place to be; (3) never scold and rail at those who are sometimes tardy or irregular, but show them that they are the losers, rather than you or the school.

7. What is the object of discipline?

Answer.—The ultimate object of discipline in school is to make the pupil a self governing individual—to give him self control. The immediate object may be to secure conditions that will make better work possible on the part of the school as a whole.

8. How would you try to lay a foundation for the love of literature in the minds of pupils in the second and third grades?

Answer.—By giving them real literature in their language and reading lessons; by storing their minds with choice sentences from writers whose language and thought will appeal to children of the primary grades.

9. What should be the teacher's attitude and duties toward the community in which he is employed?

Answer.—Rather a broad question, since there are hundreds of questions and problems on which the teacher may have an "attitude." In general, the teacher should be an

exemplary citizen and should lend encouragement to everything that will tend to make the community better and lend discouragement to everything else. He should be positive in his convictions, though not offensive in the promulgation of his theories.

10. State briefly what each of the following has done for the cause of education in America: Mary Lyon; Horace Mann.

Answer.—(1) Mary Lyon (born 1797, died 1849) was an American educator who instituted a wide movement for the higher education of women. She founded Holyoke Seminary, in 1837, the same year that Horace Mann saw the opening of the first state normal school for the training of teachers. She remained president of Holyoke until her death, twelve years later. (2) Horace Mann (born 1796, died 1859) was an educator, publicist and statesman. His greatest work was in arousing public opinion to the importance of education. He graduated from Brown University; practiced law; served in the Massachusetts Legislature for ten years, 1827-1837; served as secretary of the Massachusetts State Board of Education for twelve years; succeeded John Quincy Adams in Congress; served as president of Antioch College from 1852 till his death, in 1859.

JANUARY, 1907.

The first five questions are based upon "Rational Living," by Henry C. King.

1. What is the relation of "hurry" to rational living?

Answer.—Haste literally makes waste, and it is not often rational to hurry. This does not mean that one should do nothing rapidly—rapidity and haste are not at all alike. Hurry implies confusion and indirection, as well as lack of complete self possession.

2. To what does vagueness in thought and reasoning lead? What relation does the question of physical hygiene bear to this evil?

Answer.—It leads to poor thinking and a poor power to think. It leads to indefinite, unstable conduct in life. Bodily weariness greatly favors vagueness in thought.

3. Mention some of the questions every one must face in making any sincere attempt at self knowledge.

Answer.—Is my temperament predominately intellectual, or emotional, or volitional? Do I merely see things, or do I really think them and know them? Am I more affected by pleasure or by pain? Am I impulsive or resolute? Is expression difficult or easy for me? Do I fully understand myself?

4. What danger to the lecturer and teacher is voiced in the proverb: "The man who rings the bell cannot march in the procession"?

Answer.—That he may merely call attention to the "line of march," the "path of duty," but be unable to walk therein himself. To educate is to lead, and in order to lead one must always go before or ahead of those whom he leads.

5. Why is it necessary that emotion should find outlet in action?

Answer.—In order to make the emotion fruitful one must be able to do the thing he feels moved to do. The emotion is merely a feeling, while the action is a realization of that feeling or desire.

6. What means would you employ in the fourth and fifth grades to prepare the way for regular history instruction?

Answer.—Continue the oral instruction that should be begun in the first year, covering myth and folklore, stories of racial people, stories depicting habits, customs and occupations of people; simple biographies of typical Americans, etc. For detailed instructions, see "Williams's Course of Study for Elementary Schools," 35 cents, prepaid.

7. State the purpose of drill in teaching.

Answer.—To fix in the mind fundamental facts and principles; to form in the pupil the habits of readiness and accuracy; to enable the teacher to study the individual weaknesses of his pupils in order that he may be of most help to them individually.

8. Cite examples of the analytic and synthetic methods of giving instruction.

Answer.—In acquiring a mastery of our mother tongue we employ the synthetic method of building up smooth,

correct and forceful sentences; in the study of the science of language we employ the analytic method of dissection and separation of the elements of which it is composed.

9. In reading, do you prefer to have pupils read from their seats or come forward as a class? Why?

Answer.—In a school of several grades, such as the average rural school, it is better to have classes come forward in order to separate them from pupils who are engaged upon other lessons, and thus avoid interfering with their study. In graded schools, where all the pupils of the school constitute not more than two or three sections, it is best to have them stand by their desks and read. The reasons are obvious.

10. Give the substance of state law with regard to compulsory education in Ohio.

Answer.—All persons between the ages of eight and fourteen are required to attend school the whole time their particular school is in session, unless physically or mentally incapacitated. Persons between fourteen and sixteen must also attend school unless excused on a schooling certificate to work at some regular employment, or have completed the elementary course to the high school.

FEBRUARY, 1907.

The first five questions are based upon "Rational Living," by Henry C. King.

1. Into what three classes does King divide temperament? In each lies what tendency against the symmetrical development of character?

Answer.—(1) Intellectual, emotional and volitional. (2) If intellectual, the possessor is likely to lack the power to sympathize with others, to narrow his own life and to limit his usefulness. If emotional, he is in danger of becoming too sentimental to be substantial. If volitional, he may cultivate an unfeeling, unreasoning obstinancy.

2. What new light do King's remarks upon the asceticism of the body throw upon the teacher's practice and teaching of physiology?

Answer.—That in order to become master of the body the mind must know the laws governing every bodily action and take into account the bodily conditions.

3. What does Augustine Birrell mean by "truth-hunting"? What danger lies in this direction?

Answer.—By "truth-hunting" in the sense in which Birrell used it he meant a morbidly curious inquiry into things that do not seriously concern truth-hunting so much as a cultivation of a mere questioning spirit—a merely speculative habit.

4. Can you even passingly indulge in false emotions and experience no evil effects? Name some other cautions with regard to thought and conduct which knowledge of "the unity of the mind" imposes on you.

Answer.—(1) No. (2) Mere knowing the truth is not doing the truth. Knowledge of right and wrong—mere knowledge—will not save a man; he must compel his body and mind to follow the law pointed out by this knowledge.

5. Do we make our environment, or does our environment make us? Explain.

Answer.—Both. Our environment has much to do with our thoughts, our habits, our lives; but if our environment is not what we wish it to be we can do much to change it. Man has even been changing his environment from that of the savage to that of the civilized man. If our environment presents an ugly, depressing home life, we can seek a new environment or so modify the old that it may yield us the fruit we crave. We often say, "Circumstances make the man," but it is quite as true that a man may make his circumstances.

6. What book on teaching has helped you most? How has it helped you?

Answer.—Answers would differ.

7. Why should the teacher pay attention to the personal habits of his pupils as well as to their habits of study?

Answer.—Because the personal habits of any individual are an essential part of his education and indexes of his culture and refinement. Education makes a marked change in the facial expression, the attitude of the body, the manners, the speech and the great bundle of habits that go to make up the individual's characteristics.

8. In reading, which do you prefer, to have pupils read from their seats or come forward as a class? Why?

Answer.—This question was asked as No. 9 in the January list. See answer in that list.

9. In what period of the day's program would you place arithmetic? What is the particular value of oral arithmetic?

Answer.—Arithmetic should come early in the day's work, when the mind is fresh and less liable to fatigue. It is a subject which requires great power of concentration. Oral arithmetic is valuable because it trains the pupil to think by requiring him to hold in his mind for a longer time the several processes required in the solution.

10. Give one educational idea of Rousseau; Froebel.

Answer.—Rousseau: That the senses and the bodily capabilities must be trained as the only sure basis of memory, judgment and understanding. Froebel: He investigated the relation of the child's activities in play to the growth of his mind. Out of this study and investigation grew the kindergarten.

MARCH, 1907.

The first five questions are based upon "Rational Living," by Henry C. King.

1. Explain or paraphrase the following proverb: At forty every man is either a fool or a physician. Is it true of the physical or the intellectual life or of both?

Answer.—It means that a man has learned by the time he is forty about all he will ever learn, and if he is not able to order his own affairs by that time he is a fool. This is true, of course, only in a modified sense, and is true of both the intellectual and the physical life.

2. What is Professor James's theory of the emotions?

Answer.—James, in his Psychology, Vol. II, p. 308, says that the highest result of education is to give to one the power to suspend belief in the presence of an emotionally exciting idea.

3. What indications of the necessity of abundant physical activity are noticeable during adolescence? How great a part should muscular training play in education at this stage?

Answer.—Dr. G. Stanley Hall says, "Activity is impera-

tively necessary at adolescence," and that education must provide at this period some outlet for activity; that it is even hygienic for the physical to take the lead and receive a majority of the student's time and energy.

4. Emphasis on what branches of the school curriculum does the above question suggest?

Answer.—Manual training, drawing, gymnastics, music—these in particular; but history and the study of the achievements of the race appeal especially to boys in the adolescent period, while poetry, song and literature in general have charm for many girls. The adolescent loves excitement and adventure; the fierce combative instinct leads him to delight in danger and perilous situations.

5. State at least one fact about the philosophy or teachings of two of the following, each of whom is frequently referred to by King: Kant, Lotze, James, Stanley Hall, Lecky.

Answer.—(1) Immanuel Kant (1724-1804) was a German philosopher, a professor in the University of Königsburg from 1770 until his death. He declared: "If children are to become better than their parents, pedagogy must become a study." "The regulation of the schools should depend only on the judgment of the most enlightened judges." (2) Dr. G. Stanley Hall is president of Clark University, Worcester, Mass., and has made many valuable studies of educational problems, the chief one being the problems of adolescence.

6. Name one work on the history of education, two works on the theory and practice of teaching and two educational journals which should prove valuable to any teacher.

Answer.—(1) History of education: Williams's History of Modern Education, Boone's History of Education in the United States, Monroe's Source Book in the History of Education. (2) Theory and practice: Tompkin's Philosophy of Teaching, McMurry's General Method, Keith's Elementary Education, Roark's Method in Education. (3) The Ohio Teacher, Educational Review, Popular Educator, School Journal, The School Century, Journal of Education, and others might be named.

7. State one argument for and one against the teacher's having control over pupils on the way to and from school.

Answer.—(1) Quarrels started on the way to and from school are carried into the school and affect the standard of school discipline; hence should be brought under the control of the teacher. (2) Not much to be said against it. It is claimed by some, however, that the teacher should have nothing to do with the discipline off the school premises, because such a course would interfere with the prerogatives of the parent. The courts have many times ruled that teachers may rightfully assume control of pupils on the way to and from school.

8. Should all children be punished alike for the same offense? Why or why not?

Answer.—No, because the object of punishment is reform, and all children cannot be moved by the same argument nor by the same punishment.

9. Do you believe it advisable to adhere closely to a set daily program? Why or why not?

Answer.—No; a general program should be followed, but occasions frequently arise that make it advisable to vary widely from a fixed program. The history lesson today may be very difficult, while the geography lesson is very easy. Again, while you have the interest of your class at white heat is the best time to make a welding blow.

10. What studies are ordinarily pursued in the fifth grade of a graded school? How much home work would you expect of pupils in this grade?

Answer.—Language, elementary geography, arithmetic, including common fractions; physiology (oral), reading in a Fourth Reader or classics or both, writing, spelling, music, drawing. The home study should vary with the pupils. Some may wisely be expected to do one or two hours of home study; others none at all, depending upon the physical and mental strength of the pupils.

APRIL, 1907.

The first five questions are based upon "Rational Living," by Henry C. King.

1. What is meant by the "voluntaristic trend" of modern psychology?

Answer.—By this expression psychologists mean that we

are learning to place a higher value upon the training of the will and the formation and direction of motives as essentials in character building. Effective and fruitful living comes from doing rather than moralizing about what to do.

2. "Axioms are not axioms until they have been done by our muscles." How do you incorporate this principle into the teaching of geometry and physics classes?

Answer.—The statement may seem to be a little overdone, but the fact remains that even an axiom is not axiomatic to the individual until he has actually experienced it and thought it through.

3. Why is Matthew Arnold justified in saying that "Conduct is three-fourths of life"?

Answer.—Life is measured by what it accomplishes, not by its professions of faith and belief. A man may know the truth, yet fail to live it. Knowledge of the right will alone not save any man. Salvation is through works as well as faith, and more than faith. Not only is a man's own life moulded by what he does, but his influence upon those about him is measured more largely by his personal conduct than by his professions.

4. Why, when an improper thought comes into your mind, is it not sufficient for your power of self control to assure yourself that you will not heed it? On the contrary, what should you do?

Answer.—It is well enough under such circumstances to say, "I will not yield to this temptation," but it is far better to supplant the thought with one of the opposite tendency. The best way to uproot an evil thought is to supplant it by means of the expulsive power of a new affection, which, if stronger than the other thought or desire, will crowd out the weaker one.

5. What lesson is taught by the illustration of the traveler watching other art pilgrims looking at Raphael's Sistine Madonna?

Answer.—The study of emotions as illustrated in the living conduct of those pilgrims made stronger to him the realization of the true lesson conveyed by the picture itself.

6. What is meant by reflex action? How does this principle apply to education?

Answer.—Reflex action is that power possessed by the spinal cord and medulla oblongata of transforming afferent into efferent impulses without the interposition of the brain. It is not a matter of education or training, but a law of nature. However, a knowledge of this reflex process is valuable to the teacher, for we know that nerve cells must be recharged through nutrition after nervous energy has been expended. Good food and fresh air are necessary to keep these nerve cells in condition. See Dexter and Garlick, page 16.

7. What authorities stand behind the teacher in the enforcement of school rules and discipline?

Answer.—The statutes of Ohio, the Board of Education and the superintendent, where there is efficient supervision.

8. Name some of the ways in which your personality will affect your school.

Answer.—The teacher's personality affects the behavior, the ambition and the zeal of the pupils. If the personality is what it should be, the pupils are inspired to imitate the teacher in conduct, in various habits and in studiousness.

9. Is a teacher's general knowledge of a subject sufficient, or should she prepare separately for the individual recitation? Why?

Answer.—Depends upon the amount and kind of general knowledge the teacher possesses. There are teachers who are so thoroughly saturated in their subjects that they are ready almost any time to conduct a good recitation. The most teachers need to make preparation for each lesson. However, with many subjects and classes this is almost impossible at times.

10. Of what use to the child is play?

Answer.—Just as valuable to him as work. In fact, it usually is work. The main difference between play and work is in the nature of the interest taken. To some children some forms of play seem as irksome as work, while work to some is as interesting as play.

MAY, 1907.

The first five questions are based upon "Rational Living," by Henry C. King.

1. "Objectivity is an essential condition of both character and happiness." Explain what King means by "objectivity" and why it is an essential condition of character and happiness.

Answer.—He evidently means that we must have our minds centered on the thing we are doing rather than upon ourselves. We are made to be active, and our best contribution to the growth of character is made while we are mindful of the effect of what we do will have upon others. It calls for activity rather than passivity. One cannot win the highest happiness or achieve the largest success by brooding over what he is or what limitations have been thrown about him. We must believe in the gospel of work and work to a worthy end.

2. How does the drudgery of our daily tasks educate us?

Answer.—Drudgery, as such, is a poor teacher, but the doing of even unpleasant tasks, if those tasks are worthy in themselves and need to be done, will train us in efficiency, patience, attention, accuracy and self denial. We need to do some things that are not in themselves and of themselves pleasant.

3. Mention as many proofs as you can to show that man is essentially a social being—i. e., that his personal relations with others play a most important part in his life.

Answer.—Personal relations are exceedingly important elements in our education. The child learns to know persons before the things about it. Our personal relations are made important through our friendships, affections, hospitality, personal regard for others in particular and for humanity in general.

4. What duties toward our fellow beings does the very recognition of this social spirit in man impose upon us?

Answer.—The Golden Rule is the best illustration of this thought.

5. "Professional association is the one great hopeful

means of character." What ought this to mean to you in your chosen profession of teaching?

Answer.—Much attention to the teaching of gentleness, kindness, good manners, etc., by your own example rather than by mere precept.

6. What principle of teaching do you violate when you ask a child to memorize a definition before he understands it?

Answer.—It may be said that this method does not proceed from the known to the unknown; that it is not true inductive teaching. Definitions should be developed, should be made to grow in the understanding of the pupil by means of ample illustration, so the pupil may be able to frame a definition of his own that will be reasonably accurate.

7. Name some ways in which a teacher may help to strengthen the memory of a pupil.

Answer.—By means of drills in recalling the order of words in a miscellaneous list; by increasing his interest in the thing to be remembered—the main thing; by giving him beautiful and helpful memory gems and poems to memorize. The memory is also strengthened through the proper use of other faculties, such as the imagination, reason and sense-perception.

8. What good results should pupils gain by being required to reproduce reading lessons in their own language?

Answer.—Such a practice would improve their vocabularies and their power of expression. It would fix their attention upon details and thus increase their power of perception and of recall.

9. Mention all legal holidays occurring during the school year.

Answer.—Labor Day, first Monday in September; Thanksgiving, Christmas, New Year, Washington's Birthday, Memorial Day, Independence Day.

10. Do you believe in a system of monthly reports of pupils' standing to parents? Why or why not?

Answer.—Bi-monthly is often enough. However, opinions differ. Parents ought to be given reports of the

standing of their children so they can keep in touch with their progress and consult with teacher or pupil to ascertain the cause of unsatisfactory progress and to encourage pupils by noting satisfactory progress.

JUNE, 1907.

The first five questions are based upon "Rational Living," by Henry C. King.

1. Show from the history of literature that every phase of its development has been a protest against a one-sided view of life.

Answer.—Literature is essentially the expression of the highest motives and ideals of a people. High ideals cannot be attained except through sane processes of growth. A one-sided and narrow view of life could not make one optimistic and hopeful.

2. In the first years of his life, is the child most interested in persons or things? Does the answer to this question bear witness to man's being dependent upon or independent of personal and social relations?

Answer.—In persons. He knows persons before he learns to know things. This natural tendency and aptitude shows that man is by nature a social being and is dependent upon social and personal relations.

3. Why must there be a limit set to the intimacy of even the closest friendships?

Answer.—The individuality of a person necessitates the independence of the individual to some extent, and there are thoughts and motives and purposes that must not be made the property of even our best friends, who are merely friends. With a child and its mother this perhaps is not true.

4. Repeat the four great psychological inferences upon which King's whole discussion of Rational Living is based.

Answer.—Life is complex; man is a unity; will and action are of central importance; and the real is concrete. (See the first question in October, 1906.)

5. As the final result of his discussion, what does King conclude are the great conditions of the largest and richest life?

Answer.—To live in a place and at a time when there is large room for personal service in doing those things that will make those about us better and happier for our service. To live rationally is to foster a clean mind in a sound body, with a large share of the spirit of altruism in one's creed.

6. Have you done your duty toward your pupils when you have thoroughly taught them what is in the text-books? Why or why not?

Answer.—Certainly not. There is too much of the close adherence to the text-book in our teaching. They must be taught how to think for themselves; how to discover themselves; how to understand themselves; how to correlate what is in the books with the actual needs and duties of life; how to put into practice the knowledge given in the books or through books.

7. How does the purpose of reading differ in the primary from its purpose in the advanced grammar grades?

Answer.—In the primary grades the child should be taught first the art of reading itself. He should know the mechanics of reading and how to follow the print with his eye and his mind so that one will not outrun the other. He should also be taught to interpret the thought of the printed page, which should not be made too difficult of interpretation, and must be so taught that he will love to read. In the grammar grades he should be taught the art of interpretation, and his study there should be mainly in the direction of literary interpretation of standard classics suited to his age and development.

8. What are neutral incentives? Artificial incentives? Why is interest a good incentive?

Answer.—Natural incentives are those motives that attend effort and attainment as a natural result or consequence, such as a desire for standing or rank, a desire for approval, a desire for activity and usefulness, a desire to know, a hope of future good, etc. Artificial incentives are those rewards or incitants which are thrust between the pupil and the natural consequences of study and conduct, such as prizes, privileges, immunities, etc.

9. Do you believe in a system of school government

which includes self reporting in deportment? Why or why not?

Answer.—Rather doubtful method. It is a strong temptation to the average child to be dishonest and untruthful and defeats the very purpose of discipline and training.

10. In what part of the school program can the teacher suitably introduce moral instruction?

Answer.—Whenever occasion presents itself. No special time and no special program should be employed. The best moral instruction is incidental, and the daily and hourly bearing of the teacher has much to do with results. Lessons in literature, reading, nature study and history often afford excellent opportunity for the teacher to impart the most important lessons in morals.

JULY, 1907.

1. Explain the maxim, "The primary principle of education is self activity."

Answer.—Education is growth, development. The growth of a child's mind is due to proper stimulation from without, but the mind itself must be active. Growth itself is from within, through the individual's own activity. We learn to do by doing, to think by thinking, and likewise all forms of mental development result only from mental activity.

2. Discuss the relative values of punishment and of reward as schoolroom motives.

Answer.—The dominating spirit of the modern school is the mastery of knowledge and the doing of things through interest. Hence, punishments are administered less frequently than formerly and only as last resorts. Every normal child has inherently right tendencies, and when he makes mistakes or goes wrong he should be encouraged to try again, his face should be turned in the right direction, and when he does well he should be encouraged by it and given to know that his conduct is appreciated.

3. How does a device differ from a method? Name some devices used in teaching geography.

Answer.—A device is a plan, or scheme, or a partial method, sometimes. A device may be used to reach a

particular type of pupil who needs extraordinary methods to stimulate him or arrest and direct his attention. A game with "geography cards" may be a good thing occasionally as a device to create an interest, but we could not call it a method. One may improvise a globe out of an apple and use it for the purposes of a globe, but it couldn't be called a method.

4. Mention, in their respective order, five topics of hygiene that you would teach to pupils in the lower grades.

Answer.—Care of the skin by bathing, the dangers in catching colds and how to prevent them, importance of wholesome food, care of the nails and hair, dangers in the use of the cigarette and tobacco.

5. State the principle that should govern the infliction of punishment.

Answer.—Punishment, when inflicted, should be corrective rather than coercive or vindictive. The pupil may be deprived of a privilege he has abused, or be denied the opportunity to interfere with the rights of others. He should be made to see that the suffering or inconvenience is due to faults of his own.

6. Give the characteristics of education during the Middle Ages.

Answer.—Education during the Middle Ages was confined to the cloisters and consisted in the narrow and bigoted training of the few who were to be the "spiritual advisers" of the many. There was no originality, no invention, no encouragement of the individual.

7. What faculties of the child are predominantly appealed to during the first years of instruction? The later years?

Answer.—During his earlier years in school we may appeal to the child's imagination, memory and sense-perception. He may be taught to observe and do things that will develop his senses and appeal to his constructive powers. Later he may be taught to reason, reflect and invent in a more rational way, through a training of his reason, judgment, conception and perception.

6. What are the officers of a school district in Ohio? What are their duties?

Answer.—Depends upon the kind of school district. Township sub-districts, while they have recently been abolished in name, are retained in fact through the retention of a sub-director, whose duty is to look after the school property, report to the township board the needs in the way of repairs, fuel, etc., but he has no right to employ the teacher nor to direct the teacher in any way. Otherwise boards have a president and a clerk, but in township districts the clerk is not a member of the board, while in other districts he may be. Their duties are such as ordinarily devolve upon such officers in any organization.

9. What should be the temperature of your schoolroom? Where no special aparatus is installed, what methods, in winter, would you employ to keep your schoolroom properly ventilated?

Answer.—The temperature should be kept as near 68° F. as possible. The best way is to have the lower window sash raised a few inches and have a board inserted under it to fit closely, so as to allow the air to enter between the upper and lower sashes, the current of air being directed upward into the room.

10. Name the founder and state the purposes of the kindergarten.

Answer.—Frederich Froebel founded the kindergarten. The word means "a child garden." The purpose is to furnish natural and formative activities to the child between four and six years of age; to direct his hands and mind so as to aid each other in his development.

OHIO EXAMINATIONS AND ANSWERS

—FOR—

HIGH SCHOOL CERTIFICATES FOR 1906-'7.*

CIVIL GOVERNMENT.

Answers by C. L. Martzolff, Department of History, Ohio University.

LIST ONE.

1. Make a list of ten representative members who took part in the Constitutional Convention. When, by its own provisions, was the Constitution to become operative?

Answer.—George Washington, Alexander Hamilton, Benjamin Franklin, James Madison, Rufus King, Roger Sherman, Robert Morris, Charles C. Pinckney, Gouverneur Morris, William Blount.

"The ratification of the conventions of nine states shall be sufficient for the establishment of this Constitution between the states so ratifying them."

2. What is meant by the expression "legal tender" as used in the Constitution?

Answer.—"Legal tender" means that currency or money which the law authorizes a debtor to tender and requires a creditor to receive.

3. From what source is the money obtained to meet the running expenses of the national government?

Answer.—The national government secures its revenues by means of the tariff and excise taxes.

4. Of what advantage is it to a territory to become a state?

Answer.—It places the people of the territory on equal footing with those of the other states. It gives them better representation in Congress and a voice in the selection of their state officers. They are permitted to form a Con-

*Twelve lists a year in each high school subject are submitted by the Commissioner, but complete answers to all would make this volume too large, hence we have used only selected lists representative of all the examinations.—EDITOR.

stitution, and no longer are their legislative acts subject to the control of Congress.

5. How are United States Senators chosen? Presidential electors?

Answer.—United States Senators are chosen by the legislatures of the respective states.

Presidential electors are elected by the qualified voters of the several states.

6. How does one become a notary public? Mention some of the duties of this office.

Answer.—A notary public is appointed by the governor upon the recommendation of a common pleas judge.

A notary public may administer oaths, acknowledge the execution of documents, such as deeds and mortgages, take depositions, etc.

7. Name three powers delegated to Congress in time of war.

Answer.—Congress has power to declare war, grant letters of marque and reprisal and make rules concerning capture on land and sea.

8. Name the chief county officers in Ohio and describe the method of voting for them.

Answer.—The chief county officers are the county auditor, the clerk of the courts, the county recorder, the commissioners and the treasurer. They are elected by the qualified voters of the county, by means of the Australian ballot system.

9. How is a grand jury impaneled?

Answer.—A contrivance, known as the jury wheel, contains a number of names of eligible men in the county. The required number of jurors is selected from this wheel by chance.

10. The treaty which settled the recent Venezuelan insurgents' dispute was signed on shipboard. Why was it necessary that the ship on which this act was performed should be stationed over three miles from the Venezuelan coast?

Answer.—A treaty is always signed on neutral territory. By international agreement a seaboard country controls the sea within three miles of the coast, therefore outside that

limit would be neutral. Beyond the three mile limit is what is known as "the high seas."

LIST TWO.

Answers by H. D. Grindle, Department of History and Civics, Lima College.

1. What provision did the Constitution make for its own ratification?

Answer.—The Constitution made ratification of the convention of nine states sufficient for the establishment of it between the states ratifying the same.

2. Name six powers delegated to Congress by the Constitution.

Answer.—To borrow money on the credit of the United States. To establish postoffices and postroads. To constitute tribunals inferior to the Supreme Court. To declare war, etc. To raise and support armies. To provide and maintain a navy.

3. What is the difference between a resident and a citizen? Do all residents enjoy civil rights?

Answer.—A citizen is a free inhabitant born within the United States or naturalized. The Fourteenth Amendment declares that citizens means all persons born or naturalized in the United States and subject to the jurisdiction thereof.

All other persons, unless especially provided for by statute, would be residents merely or aliens. They generally enjoy all civil rights.

4. Mention three arguments in favor of the system of trial by jury.

Answer.—Trial by jury will secure a fairer or more impartial verdict, a less arbitrary decision, a decision where the faults of one man are overbalanced by the strong character of other men. But there are objections to the jury system also.

5. What action must be taken by the residents of a territory applying for statehood?

Answer.—Usually a memorial is sent to Congress asking leave to form a state constitution. If granted, an enabling act is passed. The constitution adopted must be approved

by Congress or by some designated authority, often the President.

6. What are the qualifications for election to the United States Senate?

Answer.—A Senator must be thirty years of age, an inhabitant of the state for which he is chosen and for nine years a citizen of the United States.

7. Define: Bill of attainder, petit larceny, reciprocity.

Answer.—A bill of attainder is a legislative act inflicting punishment (or death) without a judicial trial. Petit larceny in Ohio is a theft where the value of the goods stolen is less than $35.

Reciprocity is a conferring of mutual benefits. As applied to governments it is a treaty between them giving equal advantages as regards customs or duties on imports, or other favors.

8. What is the highest United States court? How are members appointed to it and for what length of term? Name three present incumbents.

Answer.—The Supreme Court. The members are appointed by the President and confirmed by the Senate, and their term is during good behavior. Three present incumbents are: M. W. Fuller, Chief Justice; Holmes, McKenna.

9. What are the compulsory educational requirements in Ohio?

Answer.—All pupils between ages of eight and fourteen years must attend public, private or parochial school for the full term the school is in session, which shall in no case be less than twenty-four weeks in each year, unless excused as provided by law. All pupils between fourteen and sixteen years, if unemployed, shall attend school, unless excused, and no one under sixteen shall be employed while school is in session unless he shall have a schooling certificate.

10. State three ways in which a bill may become a law in Ohio.

Answer.—A bill may become a law in Ohio by being passed by both houses of the Legislature and signed by the Governor.

By receiving a two-thirds vote of each house after a veto

by the Governor, the number of votes to be no less than on the first passage.

By the retention of a bill by the Governor more than ten days, Sundays and the day it was received excepted, after passing both houses. Adjournment of Legislature does not prevent its becoming a law, unless the Governor protests against it.

LIST THREE.

Answers by H. D. Grindle, Lima College.

1. Give in detail the processes involved in making a treaty with a foreign country.

Answer.—Treaties between the United States and other countries are negotiated by the representatives of each government. Our representative, unless a special one is appointed, would be the Secretary of State or an ambassador. If the President approves of a treaty thus made, he sends it to the Senate, a two-thirds vote of which is necessary for approval. After approval by the Senate, ratifications between the two countries take place by each country's representative signing the document.

The senate may adopt amendments, but if this is done it becomes practically a new agreement and must go back to conference again.

2. Enumerate six sole powers of the President.

Answer.—(1) He is commander-in-chief of the army and navy, and of militia when called into service. (2) He can convene Congress in extraordinary session. (3) He can adjourn Congress upon failure to agree on a date for adjournment. (4) He can fill all vacancies that occur during the recess of the Senate. (5) He can require written opinions of officers when he so desires. (6) He can grant reprieves and pardons.

3. Write not less than one hundred words on the powers and duties of the Governor of Ohio.

Answer.—Powers and duties of the Governor: He may require written opinions, convene the General Assembly and adjourn it in case of disagreement as to adjournment, grant reprieves and pardons (after conviction), veto bills passed by the Legislature.

He shall be commander-in-chief of the military and naval forces of the state, fill vacancies that occur, make appointments as designated by the statutes, issue proclamations and perform such other duties as pertain to the executive office and the enforcement of the laws.

4. What does the Constitution of Ohio say about crime? About punishment? The federal Constitution?

Answer.—When crimes are committed, bail with sufficient sureties, shall be allowed, except for capital offenses, the proof being evident, or presumption great. Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

No person shall be held to answer for a capital, or otherwise infamous crime, unless on presentment or indictment of a grand jury.

The foregoing is substantially the same in the "Bill of Rights" of the Constitution of the U. S. See Articles V to VIII of amendments. A speedy trial by jury, privilege of witnesses, right to confront them, and where crime was committed, are the essentials.

5. What industrial schools, reformatories and asylums are supported in this state. Locate each.

Answer.—Boys' Industrial School, Lancaster; Girls' Industrial Home, Delaware; Ohio State Reformatory, Mansfield; State Hospitals for Insane, Toledo, Cleveland, Columbus, Lima, Dayton, Athens, and Massillon; for Epileptics, Gallipolis; State School for the Blind, Columbus; for the Deaf and Dumb, Columbus.

6. Give the substance of five educational bills passed by the 77th General Assembly.

Answer.—Increase of commissioner's salary to $4000. Fixing his term at two years. For a greater levy than the maximum allowed by law. Minimum salary of $40 per month for teachers. Amendment of teachers' pension act.

7. What does the Constitution of this state say about corporations? About trusts? Has Ohio an anti-trust law; if so, has it accomplished its purpose?

Answer.—Corporations may be organized by five or more persons in Ohio.

Trusts in restraint of trade are illegal.

The Valentine anti-trust law is in force, and pending cases will determine whether it is effective or not.

8. Under what authority are elections held? To what extent has the federal government authority over them?

Answer.—Elections are held under state authority. The Constitution of the United States says: "The times, places and manner of holding elections for senators shall be prescribed by the legislatures. But Congress may at any time make or alter such regulations, except as to the place of choosing senators." Also, all persons are allowed to vote for a United States representative who are qualified to vote for a state representative. The federal government may supervise elections for national officers, should Congress deem it proper to pass a law for that purpose.

9. Mention five recommendations made by the President in his last message.

Answer.—Citizenship for Japanese residents. A law governing the procedure of courts in labor and capital contests. Recommendation that public lands containing mineral deposits be held by the government and worked under government supervision.

That American schools should be open to orientals where treaties made by us guarantee them equal rights with other nations.

More freedom in affairs of government to the inhabitants of Porto Rico. As near free trade as possible with the Philippines.

10. Name President Roosevelt's new cabinet.

Answer.—Since March 4, the cabinet is:

Elihu Root—Secretary of State.
George B. Cortelyou.—Secretary of Treasury.
William H. Taft—Secretary of War.
Charles J. Bonaparte—Attorney General.
George Von L. Meyer—Postmaster General.
Victor H. Metcalf—Secretary of Navy.
James R. Garfield—Secretary of Interior.
James Wilson—Secretary of Agriculture.
Oscar S. Straus—Secretary of Commerce and Labor.
The senate confirmed all these nominations.

LIST FOUR.

Answers by C. L. Martzolff, Department of History, Ohio University, Athens, O.

1. Name five rights guaranteed by the United States Constitution to persons accused of crime.

Answer.—(a) Can not be held for crime unless on a presentment of a grand jury.

(b) Can not be put in jeopardy twice for the same offense.

(c) Can not be deprived of life or liberty without due process of law.

(e) Has a right to a speedy trial by an impartial jury.

2. In the third clause of the second section in the first article of the Constitution, relating to the apportionment of representation and taxation, who are referred to in the words "three-fifths of all other persons"? Why was not a more specific term used?

Answer.—The slave is the "person" referred to in the clause mentioned. The claims of the free states were that slaves were property, only citizens could be justly counted in representation in Congress. Consequently in the Constitution, if slaves were specifically mentioned, it would be tantamount to recognizing their citizenship.

3. What amendments to the United States Constitution were made during Johnson's administration?

Answer.—The Thirteenth and Fourteenth Amendments were adopted in Johnson's administration.

4. What is arbitration? Name three disputes, to which the United States was a party, that were settled by arbitration.

Answer.—An arbitration is the occasion of two contesting powers that mutually agree to allow a third disinterested power or union of powers to decide the point in dispute.

The Alabama Claims, settled by the Geneva award of 1871.

The Canadian Fisheries award of 1877.

The Bering Sea Seal Fisheries award of 1893.

5. Explain the method of nominating presidential candidates.

Answer.—The convention nominating a presidential candidate consists of delegates from the several states. Each state is entitled to twice as many representatives as it has senators and representatives in Congress.

6. Define treason. What does the Constitution say concerning its punishment? Of what treason was Aaron Burr accused?

Answer.—Treason consists in levying war against the United States, or in adhering to its enemies or giving them aid and comfort. Congress has power to determine the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted.

The charges preferred against Burr were that he was conspiring to detach the southwestern part of the United States and build an empire of his own. This, if true, would be "levying war against the United States."

7. What is jurisdiction? In what cases has the Supreme Court of the United States original jurisdiction?

Answer.—Jurisdiction is the specification or determination of the classes of cases over which a court has control. The Supreme Court of the United States has original jurisdiction in all cases affecting ambassadors, other public ministers and consuls; and in cases to which a state is a party. The rest of its jurisdiction is appellate.

8. Of what great value to the country is the organization of state militia? To what extent is the militia under the control of the national government?

Answer.—The militia affords the country a body of trained soldiers that can be called forth in time of urgent need. It affords protection to a state without calling upon the national government in emergencies.

In case the federal government needs the militia "to suppress insurrections or repel invasions," the President issues a call to the governor of the states, who thereupon furnish the necessary troops. They then become a part of the military force of the United States.

9. What is the value of a passport? Where are passports obtained in the United States?

Answer.—A passport is the testimony of a country veri-

fying the citizenship of a person traveling in another country. It gives to the citizen bearing it the courtesy and respect that his country merits. It is a letter of introduction. Passports are issued through the office of the Secretary of State.

10. In an Ohio city government what constitutes the legislative department? The judicial department?

Answer.—The municipal council is the legislative department of an Ohio city government.

The judicial power is vested in the police court or in the court held by the mayor.

LIST FIVE.

Answers by C. L. Martzolff, Department of History, Ohio University.

1. Name the several forms of government and give an example of each.

Answer.—Aristotle's divisions of governments were: The monarchy, the aristocracy, and the democracy. Examples of these forms may be found in Russia, ancient Venice, and that of Athens. Most modern governments are modifications or combinations of these primal forms. England, for instance, contains all three kinds, in her King, her House of Lords, and the modified democracy in her Commons.

2. What imperfect union existed before the adoption of the United States Constitution? In what respects was it imperfect?

Answer.—The states under the Articles of Confederation were united in a sort of commercial union, but the individual states sought to retain their sovereignty and in a measure to act as the agent of the general government in internal affairs, while they looked upon the general government as an agent to look after the interests of the states in foreign affairs. The union was necessarily imperfect because it had no power but what sovereign states from time to time delegated to it.

3. Name two statesmen who were active in preparing the public mind for a change. Can you name two patriots who vigorously opposed the new Constitution?

Answer.—James Madison and Benjamin Franklin by their writings and public acts both endeavored to emphasize the desirability of a new and stronger government. On the other hand, Samuel Adams, John Hancock, and Patrick Henry were vigorous opposers of the Constitutional Convention.

4. What state refused to adopt the Constitution? What was the action of Rhode Island in regard to it?

Answer.—North Carolina adjourned her ratifying convention without favorable action, but subsequently recalled it and sought admission to the Union. Rhode Island refused to call a convention for ratification, and was the last of the states to come into the Union.

5. What are the qualifications of a representative as to age? Must he be an inhabitant of the district for which he is chosen?

Answer.—A representative must be not less than twenty-five years of age. He need not be a resident from the district for which he is chosen.

6. If Congress should pass a law appropriating a million dollars for the liberal cause in Russia, would the act be constitutional? Why?

Answer.—It would be constitutional. The interference of the United States with Spain in the Cuban affair furnishes us a precedent.

7. In whom is the power to declare war vested? The power to make treaties?

Answer.—The power to declare war is vested in Congress. The President by and with the consent of the senate makes treaties.

8. Of what does the Supreme Court of the United States consist? What is the term of office of a judge of this court?

Answer.—The Supreme Court of the United States consists of a Chief Justice and eight associates, who hold office for life or good behavior.

9. How is treason defined in the Constitution?

Answer.—"Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, or giving them aid and comfort."

10. What constitutional provision is there regarding "freedom of speech"?

Answer.—"Congress shall make no law abridging the freedom of speech, or of the press."

LATIN.

Answers by Prof. D. J. Evans, Head of the Department of Latin, Ohio University, Athens, O.

LIST ONE.

1. Translate:

Etenim quid est, Catilina, quod iam amplius exspectes, si neque nox tenebris obscurare coetus nefarios nec privata domus parietibus continere voces coniuratienis tuae potest? si inlustrantur, si erumpunt; mihi crede, obliviscere caedis atque incendiorum. Teneris undique; luce sunt clariora nobis tua consilia omnia, quae iam mecum licet recognoscas. Meministine me ante diem XII. Kalendas Novembris dicere in senatu, force in armis certo die, qui dies futurus esset ante diem Vi. Kal Novembris, C. Manlium, audaciae satellitem atque administrum tuae? Num me fefellit, Catilina, non modo res tanta, tam atrox tamque incredibilis, verum, id quod multo magis est admirandum, dies?—Cicero, In Catilinam, 1, 3. (40 credits.)

Translation.—(In Catilinam I., 3.) And really Catiline, what is there that you may await for, if neither night with its shades can conceal your infamous gatherings, nor a private home with its walls hold in mutterings of conspiracy? If everything comes to light and breaks out? Change that detestable purpose right away; believe me and put away thoughts of murder and burning. You are detected on all sides; clearer to us than the light are all your schemes, and you may review them now with me. Do you not remember that on October 21 I said in the senate, that, on a certain day, which day was intended to

be October 27, C. Manlius, a minion and tool of your recklessness, would take up arms? Was I mistaken, Catiline, not only regarding an act so significant, extraordinary and inhuman, but what is much more to be marveled at, was I mistaken in the day?

2. Tell where each of the following verb forms is found and give the principal parts of the verb from which it is taken: erumpunt (6), teneris (8), meministe (11), fore (12), fefellit (16). (10 credits.)

Answer.—(a) **erumpunt:** erumpere, 3, erupi, eruptus. Indic., pres., act., 3d plural.

(b) **teneris:** tenŏ, 2, teuni, tentus. Ind., pres., pass., 2d singular.

(c) **meministi:** Defective; found only in the perfect tenses. Active verb, ind., 2d sing.

(d) **fore-futurum esse:** sum, esse, fui, futurus. Infin., fut.

(e) **fefellit:** fallo, 3, fefelli, falsus. Ind., perf. act., 3d sing.

3. Give the syntax of recognoscas (10), dicere (12), and est admirandum (18). What other mood and tense might have been used instead of **recognoscas?** What other form might have replaced **meministine?** (10 credits.)

Answer.—(a) **Recognoscas** is subjunctive with **licet, ut** omitted.

(b) **dicere** is the predicate verb of the object clause **ne . . . . dicere,** etc.

(c) **est admirandum:** Indicative perphrastic, present, predicate verb of the clause **quod . . . . admirandum.**

(d) **licet recognoscas**—licet te recognoscere—licet tibi recognoscere.

(e) **meministine—nonne meministi.**

4. Explain the case of parietibus (4) caedis (7), luce (9), diem (11), and dies (19). (10 credits.)

Answer.—(a) parietibus: Ablative of means.

(b) **caedis:** Genitive, object of **obliviscere.**

(c) **luce:** Abl. in comparison without **quam.**

(d) **diem:** Is an idiomatic construction. In meaning it is ablative, but in form it is accusative, attracted by **ante,** being inserted as a sort of paranthetical phrase. The

words **ante diem** with the ordinal are treated as one word governing the accusative, and often governed also by a preposition requiring the acc. or abl.

(e) **dies:** Nominative, subject of futurus esset.

5. Translate into Latin:

(a) I will show you how this conspiracy can be defeated.

(b) On the twenty-ninth day of October, O Catiline, many left Rome to avoid your wicked companions.

(c) If Manlius had not taken up arms, your designs might longer have remained secret.

(d) Catiline, you are completely surrounded; everything that you do is reported to me at once.

(e) Have you forgotten that the meeting of your conspirators is known? (30 credits.)

Answer.—Translation of English exercises. (a) Demonstrabo vobis quo modo haec conjuratio reprimi possit.

(b) Complures, Catilina, ante diem tertium decinum Kalendas Novembres. [a. d. xiii, Kal. Nov.] Roma decesserunt, ut socio improbos tuos vitarent. [vitandorum sociorum improborum tuorum causa.]

(c) Nisi Manlius arma cepisset, consilia ista tua obscura longius mansissent.

(d) Undique, Catiline, teneris: ea omnia, quae facis, [omnia abs te facta] ad me statim referuntur.

(e) Esne oblitus coetus sociorum tuorum sciri?

LIST TWO.

1. Translate:

Quamquam, patres conscripti, quae potest esse in tanti sceleris immanitate punienda crudelitas? Ego enim de meo sensu judico. Nam ita mihi salva re publica vobiscum perfrui liceat, ut ego—quod in hac causa vehementior sum—non atrocitate animi moveor (quis enim est me mitior?), sed singulari quadam humanitate et misericordia. Videor enim mihi videre hanc urbem, lucem orbis terarum atque arcem omnium gentium, subito uno incendio concidentem; cerno animo sepulta in patria miseros atque insepultos acervos civium; versatur mihi ante oculos aspectus Cethegi et furor investra caede bacchantis. (30 credits.)

Answer.—English Translation of III Orat. in Cat.—And yet, senators, what cruelty can there be in punishing the enormity of so great a crime? I judge from my own feelings I assure you, as I seem in this case more severe than usual, that I wish I may enjoy in your company a republic as truly safe, as I am not actuated by ferocity of mind, (for who is kinder than I?), but by unusual kindness and mercy.

2. Explain the case of the following words: punienda (2); atrociate (5); me (5); animo (9); mihi (10); Cethegi (11); bacchantis (11). (15 credits.)

Answer.—(a) **punienda;** a gerundive in the ablative with **immanitate.**

(b) **atrocitate;** ablative of means.

(c) **me;** ablative of comparison, **quam** being omitted.

(d) **animo;** ablative of means or instrument.

(e) **mihi;** dative of possession.

(f) **Cethegi;** objective genitive.

(g) **bacchantis;** genitive of present active participle to agree with **Cethegi.**

3. Compare the following: salva (3); vehementior (4); mitior (6); miseros (9). Give the principal parts of the following: punienda (2); perfrui (4); moveor (5); videre (7); cerno (9). (15 credits.)

Answer.—See any Latin lexicon and grammar.

4. Translate:

Senators, if you do as I shall suggest, your action will preserve the peace of the Roman state. I now ask to be allowed to show you that in such a case as this the most severe punishment is not cruelty. When I see the citizens unburied and Cethegus appear before my eyes in full power, I think I should be most cruel if I did not punish the conspirators very severely. (20 credits.)

Answer.—This may be rendered into Latin in more than one form. I would regard either of the following equivalent to the English of the first sentence: (a) Si, feceritis, patres conscripti, quo modo admonuero, actio vestra pacem reipublicae Romanae conservabitis.

Nunc rogo ut in hac causa (in hujus modi causa) poenam gravissiman esse non crudelitatem.

Cum cives insepultos, et Cethegum visum mihi ante oculos regantem videam, crudelissimus essem, ut arbitror, nisi conjuratos accerime punirem; (or) nisi de conjuratis acerrimum supplicium sumerem.

5. Give the Latin derivation of each of the following English words: sanctify; agrarian; congest; valedictory; edifice.

Write original sentences to illustrate the dative of agent; the genitive of price. (15 credits.)

Answer.—(a) Sanctify; from **sancire,** to make inviolate, and **facere,** to make.

(b) **agrarian;** from **ager,** field, and the suffix **i-anus,** denoting "belonging to."

(c) **congest;** from the prefix **con-cum**—together, and **gerere,** to gather.

(d) **valedictory;** from **vale,** farewell, and **dicere,** to say, with the suffixes **tor,** denoting the agent, and **it,** denoting action. The act of one saying farewell.

(e) **edifice;** from **aedes,** house or hearth, and **facere,** to make, and suffix **io,** denoting place where. **Edifice**—place where the hearth is made.

(f) Original sentences illustrating one use of the dative agent:

(a) Virtus mihi colenda est.—Virtue ought to be cultivated by me.

(b) Novum Eboracum mihi eundum est.—I must go to New York.

Genitive of price:

(c) Magni est scire multa.—It is worth while to know many things.

LIST THREE.

1. Translate:

Re frumentaria comparata equitibusque delectis, iter in ea loca facere coepit, quibus in locis esse Germanos audiebat. A quibus cum paucorum dierum **iter** abettet, legati ab iis venerunt, quorum haec fuit oratio; Germanos neque priores populo Romano **bellum** inferre, neque tamen recusare, si lacessantur, quin armis **contendant,** quod Germanorum consuetudo sit a **maioribus** tradita, quicumque **bellum inferant,** resistere neque deprecari.

Answer.—(Caesar, Book IV, Sect. 7.) Having provided supplies, and selecting his cavalry (horsemen) he began to march toward the places in which he was hearing that the Germans were. And when he was a few days' march from them, there came from them ambassadors whose message was the following: They are not making war first on the Roman people, and yet they do not refuse if attacked to strive [with them] in arms, because it is the Germans' custom handed down by their forefathers to resist, whoever makes war [upon them], and not beg off.

2. Translate:

Iam vero virtuti Cn. Pompei quae potest oratio **par** inveniri? Quid est quod quisquam aut **illo** dignum aut vobis novum aut cuiquam inauditum possit adferre? Neque enim illae sunt solae virtutes imperatoriae, quae vulgo existimantur, labor in negotiis, fortitudo in periculis, industria in **agendo,** celeritas in conficiendo, consilium in providendo; quae tanta sunt in hoc uno, quanta in omnibus reliquis imperatoribus, **quos** aut vidimus aut audivimus, non fuerunt.

Answer.—(Cicero's Orat. pro Lege Manilia, Chapt. IX.) Now then what language can be found to fit the excellence of G. Pompey? What can anyone offer that is either worthy of him, new to you, or unknown to anyone? For those are not the only virtues of a general which are commonly regarded so! [such as] attention to details, courage in perils, energy in acting, swiftness in executing, and wisdom in providing [for emergencies], and these are in such perfection in this one man as they are not in all the other generals that we have seen or heard of.

3. Give the syntax of words in bold face in 1 and 2.

Answer.—**iter,** Accusative of the Extent of Space. **bellum,** Acc. object of **inferre. contendant,** Predicate verb of the clause that is the object of **recusare. majoribus,** Ablative. May be regarded either as "agent" or "source." **par,** Adjective, in agreement with **oratio. illo,** Ablative, required by **dignum. agendo,** Gerund, abl. Specification. **quos,** Accusative, direct object of **vidimus** and **audimus.**

4. (a) Conjugate the first three finite verbs in 1 in the tenses in which they are used.

(b) Give principal parts of potest, venerunt, adfierre, contendant, facere.

Answer.—(a) 1. **coepi, isti it;** imus, **istis, erunt.** 2. **audiebam, bas, bat, barnus,** batis, bant. 3. **abessem, ses, set; sernus,** setis, sent.

(b) 1. **possum, posse, potui.** 2. **venio, ire, veni, ventum.** 3. **adfer, ferre, tuli, latum.** 4. **contendo ere di, tentum.** 5. **facio, facere, feci, factum.**

5. Render in Latin:

(a) He heard that we were coming.

(b) Be not unjust.

(c) Bravery is not the only quality we should look for in a commander.

Answer.—(a) Nos venturos esse audivit.

(b) Sing: Noli esse injustus; plu., Nolite esse injusti.

(c) Non Fortitudo est sola virtus quam imperatoriam existimamus.

LIST FOUR.

1. Translate:

Exigua parte aestatis reliqua. Caesar etsi in his locis, quod omnis Gallia ad septentriones vergit, maturae sunt hiemes, tamen in Britanniam proficisci contendit, quod omnibus fere Gallicis bellis hostibus nostris inde subministrata auxilia intellegebat et, si tempus [anni] ad bellum gerendum deficeret, tamen magno sibi usui fore arbitrabatur, si modo insulam adisset, genus hominum perspexisset, loca, portus, aditus cognovisset; quae omnia fere Gallis erant incognita.—Caesar, Book IV. (30 credits.)

Answer.—(a) Although only a small part of the summer remained, and though the winters in these places are early, because Gaul lies toward the North, yet Caesar hastens to set out to Britain, as he was aware that from there aid in various forms was furnished our enemies for nearly all the Gallic wars; and if the season should not hold out to carry on a campaign, yet he was thinking it would be a great advantage to him, if he should only visit the island and see its people and learn about the position of its harbors and approaches, as all these things were unknown to the Gauls. (Caesar, Book IV, Chapter 20.)

2. Translate:

Ego minus saepo do ad vos litteras quam possum, propterea quod cum omnia mihi tempora sunt misera, tum vero, cum aut scribo ad vos aut vestras lego, conficior lacrimis sic ut ferre non possim. Quod utinam minus vitae cupidi fuissemus! Certe nihil aut non multum in vita mali vidissemus.—Cicero, Letters.

Give and account for the mood and tense of **possim** and **fuissemus.** (30 credits.)

Answer.—I am sending letters to you less often than I am able to send because that not only all the conditions of things, as far as I am concerned, are full of wretchedness, but also truly, while I am either writing (letters) to you or reading yours, I am so overcome with weeping that I am not able to bear it. Would it were so that we had been less fond of life. Then we would have seen none or at most, not much of life's ills. (Cicero's Letters to Friends, Book I, Letter IV.)

3. Translate:

When he had finished the war with the Germans, Caesar thought that for many reasons he ought to go to Rome. But he wished first to cross the Rhine before other Germans had crossed over into Gaul, because he had heard that a body had set out to take posession of the left bank, and they would harass the Gauls if they were allowed to do this. (20 credits.)

Answer.—Bello Germanico confecto, Caesar multis de causis Romam sibi eundum esse putabat. Primo autem volebat prius Rhenum transire, quam in Galliam alii Germani transirent. Etenim audierat profectam, ut sinistram ripam occuparet, ease manum, quae, si hoc fieri permitteretu Gallos lacesseret.

4. Write in Latin and translate into English, sentences illustrating the following: (a) the cases used to express separation; (b) the uses of the participle to express (1) time, and (2) cause; (c) a condition contrary to fact; (d) the distinction between the gerund and gerundive constructions; (e) an indirect question; (f) the superlative with partitive genitive. (20 credits.)

Answer.—(a) Separation. 1. Dative.

Aurum anulum **ei** detraxit.

He took the gold ring from him.

2. Ablative: **Oculis** eum privavit.
He deprived him of sight. (lit., of his eyes.)
3. Genitive: **Laboris** decipitur.
He is beguiled of his suffering.

(b) Participles.

1. Time: Occisus est a cena **rediens.**
He was slain returning from dinner.
2. Cause: Motum expectans dilectum habuit.
Expecting an uprising he raised an army.
(lit., held a levy.)

(c) Condition contrary to fact.
Si viveret, verba ejus audiretis.
If he were alive, you would hear his words.

(d) Gerund: condendo urbem—by building a city.

The gerundive is always a transitive verb. The gerund of a transitive verb was used but sparingly.

(e) Indirect question: Video quid mea intersit.
I see what is to my interest.

(f) Superlative with partitive genitive.
Horum ominum fortissimi sunt Belgae.
The Belgae are the bravest of all these.

ALGEBRA.

Solutions by Supt. W. N. Davis, Oak Hill, O.

LIST ONE.

1. Factor: $x^2-6x-91$; $x^4+x^2y^2+y^4$; $1-(x-y)^3$.

Solution. — $x^2-6x-91=(x-13)\ (x+7)$; $x^4+x^2y^2+y^4=x^4+2x^2y^2+y^4-x^2y^2=(x^2+y^2)-x^2y^2=(x^2+y^2+xy)\ (x^2+y^2-xy)$. $1-(x-y)^3=[1-(x-y)]\ [1+(x-y)+(x-y)^2]=(1-x+y)\ (1+x-y+x^2-2xy+y^2)$.

2. Divide $a^{2n}-b^{3m}$ by $a^{\frac{n}{2}}-b^{-\frac{3m}{4}}$

Solution.—Dividing, we get

$$a^{\frac{3n}{2}}+a^{n}\,b^{-\frac{3m}{4}}+a^{\frac{n}{2}}b^{-\frac{3m}{2}}+b^{-\frac{9m}{4}}$$

This may be divided to advantage by considering that the difference of the 4th powers of two quantities is to be divided by the difference of the quantities.

3. Find the fifth term of $(a-2b)^{10}$.

Solution.—Expanding to 5 terms, we have $(a-2b)^{10}=a^{10}-20\ a^9b+180\ a^8b^2-960\ a^7b^3+3360\ a^6b^4$..... Hence the 5th term is $+3360\ a^6b^4$.

4. What is the fraction which if you quadruple the numerator and add 3 to the denominator will be doubled, but if you add 2 to the numerator and quadruple the denominator will be halved?

Solution.—Let x be the numerator and y the denominator of the fraction. By first condition,

$$\frac{4x}{y+3}=\frac{2x}{y}.\quad \text{By second condition}\quad \frac{x+2}{4y}=\frac{x}{2y}$$

Clearing and solving, $x=2$ and $y=3$. $\therefore$ The fraction is $\frac{2}{3}$.

5. Form the equation whose roots are $-\frac{8}{3}$ and $\frac{4}{7}$.

Solution.—Since there are two roots, the equation must be a quadratic. As every quadratic may be solved by factoring, the two roots with signs changed will each be the second number of the two binomial factors of the quadratic

expression. The equation is $(x+{}^{3}/_{3})\ (x-{}^{4}/_{7})=0$ or $x^2+{}^{1}/_{1}{}^{44}/_{21}x={}^{32}/_{21}$.

6. If a:b::c:d, prove (*a*) d:c::b:a. (*b*) $\sqrt[n]{a} : \sqrt[n]{b} :: \sqrt[n]{c} : \sqrt[n]{d}$.

Solution.—Proof (*a*). a:b::c:d may be written $\frac{a}{b}=\frac{c}{d}$.

Inverting, $\frac{b}{a}=\frac{d}{c}$ and $\frac{d}{c}=\frac{b}{a}$, or d:c::b:a. Q. E. D.

7. Find the value of

$$\frac{1}{(x-z)\ (z-y)}+\frac{1}{(x-y)\ (y-z)}+\frac{1}{(y-x)\ (z-x)}$$

Solution.—This expression is equivalent to

$$\frac{1}{(x-y)\ (y-z)}-\frac{1}{(x-z)\ (y-z)}+\frac{1}{(x-y)\ (x-z)}=$$

$$\frac{x-z}{(x-y)\ (x-z)\ (y-z)}-\frac{x-y}{(x-y)\ (x-z)\ (y-z)}+$$

$$\frac{y-z}{(x-y)\ (x-z)\ (y-z)}-\frac{x-z\ -\ x+y\ +\ y-z}{(x-y)\ (x-z)\ (y-z)}=$$

$$\frac{2\,(y-z)}{(x-y)\ (x-z)\ (y-z)}=\frac{2}{(x-y)\ (x-z)}$$

$$\frac{1}{(x-y)\ (x-z)}=\frac{1}{(x-y)\ (x-z)}$$

8. Solve: $\frac{}{x+\sqrt{a-x^2}}+\frac{}{x-\sqrt{a-x^2}}=2x$.

Solution.—Clearing, $x-\sqrt{(a-x^2)}+x+\sqrt{(a-x^2)}=2x\quad(2x^2-a)$.

$2x=2x(2x^2-a)$. $2x^2-a=1$. $2x^2=a+1$. $x^2=\frac{a+1}{2}$. $x=\pm\frac{\sqrt{(a+1)}}{2}$.

9. Derive the formula for the sum of a series in arithmetical progression.

Solution.—Let a = the first term, d the common difference, l the last term, n the number of terms and s the sum. The series is a, a+d, a+2d, a+3d, a+4d, a+5d.....

s=a+a+d+a+2d+a+3d+a+4d+a+5d....

s=a+5d+a+4d+a+3d+a+2d+a+d+a

adding, $2s=n(a+1)$ and $s=\frac{n}{2}(a+1)$.

10. Solve: $\begin{cases} x^2+xy=10 \\ xy+2y^2=24 \end{cases}$

Solution.—From 1st equation $y=\frac{10-x^2}{x}$. Substituting this value of y in the second equation,

$10-x^2+2\left\{\frac{100-20x^2+x^4}{x^2}\right\}=24$. Clearing and transposing $x^4-54x^2=200$. Completing the square, $x^4-54x^2+729=529$. Extracting $x^2-27=\pm 23$, $x^2=4$, $x=\pm 2$ and $y=3$.

LIST TWO.

1. Find the L. C. M. of $x^3-9x^2+26x-24$ and $x^3-12x^2+47x-60$.

Solution.—Factoring the expressions, we get $(x-2)$ $(x-3)$ $(x-4)$ and $(x-3)$ $(x-4)$ $(x-5)$. The common factors are $x-3$ and $x-4$ and the least common multiple is $(x-2)$ $(x-3)$ $(x-4)$ $(x-5)=x^4-14x^3+71x^2-154x+120$.

2. Factor: x^6+y^6; $12a^2+4a-1$; $x^{-2}+x^{-1}y^{-1}+y^{-2}$.

Solution.— $x^6+y^6=(x^2+y^2)$ $(x^4-x^2y^2+y^4)$. $12a^2+4a-1=(6a-1\ (2a+1)$. The third expression cannot be separated into rational factors. $x^{-2}+x^{-1}y^{-1}+y^{-2}=$

$$y^{-1}+y^{-2}=\frac{1}{x^2}+\frac{1}{xy}+\frac{1}{y^2}=\frac{1}{x^2}+\frac{2}{xy}+\frac{1}{y^2}-\frac{1}{xy}=$$
$$\left(\frac{1}{x}+\frac{1}{y}\right)^2-\left(\frac{1}{\sqrt{xy}}\right)^2=\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{\sqrt{xy}}\right)$$
$$\left(\frac{1}{x}+\frac{1}{y}-\frac{1}{\sqrt{xy}}\right) \text{ or } (x^{-1}+y^{-1}+-\tfrac{1}{2}y^{-\frac{1}{2}})\ (x^{-1}+y^{-1}-x^{-\frac{1}{2}}\ y^{-\frac{1}{2}}).$$

3. When, between 12 and 1 o'clock, do the minute and hour hands point in opposite directions?

Solution.—Let $12x=$ distance the minute hand has traveled and x the distance the hour hand has traveled since 12 o'clock. Then $12x=x+30$ min. $11x=30$ min. $x=\frac{30}{11}$ min. $12x=32\frac{8}{11}$ min. after 12 o'clock.

4. Simplify: $\frac{1}{(x+a)^2}+\frac{1}{(x-a)^2}+\frac{1}{x^2-a^2}$.

Solution.—The least common denominator of the fractions is $x^4+2a^2x^2+a^4$. Reducing the fractions each to that denominator, we have for the numerators, $(x-a)^2$ $(x+a)^2$ and x^2-a^2. Adding numerators, we have $3x^2+a^2$. Hence the simplified form of the expression is $\frac{3x^2+a^2}{x^4+2a^2a^2+x^4}$

5. Show that $a^\circ=1$; show that $a^{-m}=1\div a^m$.

Proof.—(1) $\frac{a^n}{a^n}=a^{n-n}=a^\circ$; but $\frac{a^n}{a^n}=1$. $\therefore a^\circ=1$.

(2) $\frac{a^n}{a^{m+n}}=\frac{1}{a^m}$; but $\frac{a^n}{a^{m+n}}=a^{-m}$. $\therefore a^{-m}=\frac{1}{a^m}$.

6. In the following expression place the co-efficient under the radical: $\frac{2}{3}\sqrt[3]{5}$.

Solution.—$\frac{2}{3}\sqrt[3]{5}=\sqrt[3]{[(\frac{2}{3})^2]\times 5}=\sqrt[3]{\frac{40}{27}}$.

7. Expand according to the binomial theorem: $(2+5x)^5$.

Solution.—$(2+5x)^5=2^5+5(2)^4(5x)+10(2)^3(5x)^2+10(2)^2(5x)^3+5$ (2) $(5x)^4+(5x)^5=32+400x+2000x^2+5000x^3+6250x^4+3125x^5$.

8. Extract the square root of $41+12\sqrt{5}$.

Solution.—Let $\sqrt{x}+\sqrt{y}$ be the binomial whose square produced the general binomial surd, $a+\sqrt{b}$.

Solving, $x=\frac{a+\sqrt{(a^2-b)}}{2}$. $y=\frac{a-\sqrt{(a^2-b)}}{2}$.

Substituting 41 for a and $12\sqrt{5}$ for $\sqrt{b}$, we have

$x=\frac{41+\sqrt{[41^2-(12\sqrt{5})^2]}}{2}=36.$

and $y=\frac{41-\sqrt{[41^2-(12\sqrt{5})^2]}}{2}=5.$

$\therefore \sqrt{x}+\sqrt{y}=6+\sqrt{5}$, the required root.

9. Solve: $2x-3\sqrt{xy}-5y=4$. $x+\sqrt{xy}+y=13$.

Solution.—Multiplying the second equation by 3 and adding to the first equation, we get $5x-2y=43$, from which $x=\frac{2y+42}{5}$. Multiplying the second equation by 2, sub-

tracting and squaring, we have $25xy=484-308y+49y^2$. Substituting $\frac{2y+43}{5}$ for x in this equation, transposing, combining and dividing by the coefficient of y^2, we have $y^2-\frac{523}{39}y=-484$. Completing square, $y^2-\frac{523}{39}y+\frac{273529}{6084}=\frac{198025}{6084}$. Extracting, $y-\frac{523}{78}=\frac{445}{78}$. $y=1$. Substituting and solving for x in equation $x=\frac{2y+43}{5}$, $x=9$.

10. With regard to roots, distinguish between the following: Real and imaginary; rational and irrational.

Answer.—A real root is one having an assignable arithmetical or numerical value or meaning.

An imaginary root is the square root of a negative number.

A rational root is one which can be expressed as an integer or a fraction.

An irrational number or surd is one which cannot be exactly expressed as an integer or a fraction.

LIST THREE.

1. Find the greatest common factor of $8x^2+2x-3$ and $6x^3+5x^2-2$.

Solution.—Factoring the expressions, we get $(2x-1)$ $(4x+3)$ and $(2x-1)$ $(3x^2+4x+2)$. The common factor, $2x-1$, is the greatest common divisor.

2. Add: $\frac{x-a}{x+a)^2}$, $\frac{x+a}{(x-a)^2}$ and $\frac{2x(3a-x)}{(x-a)\ (x+a)^2}$

Solution.—The least common denominator of the fractions is $(x+a)^2$ $(x-a)^2$. Reducing the fractions to this denominator, we have for the numerators, $(x-a)$, $(x-a)^2$, $(x+a)$, $(x+a)^2$ and $2x(x-a)$ $(3a-x)$. Expanding these numerators and adding, we get $8\ ax^2$. Hence the sum of the fractions is $\frac{8\ ax^2}{(x+x)^2\ (x-a)^2}$

3. The sum of two fractions, with numerators of 2 and 5 respectively, is 1½; if their denominators are interchanged, the sum of the fractions is 2. Find the fractions.

Solution.—Let x and y be the denominators of the fractions whose numerators are 2 and 5 respectively. Then $\frac{2}{x}+\frac{5}{y}=\frac{3}{2}$ and $\frac{5}{x}+\frac{2}{y}=2$. Multiplying the first equation by 5, the second by 2, and subtracting, $\frac{21}{y}=\frac{7}{2}$, $7y=42$, $y=6$, $x=3$. ∴ The fractions are ⅔ and ⅚.

4. If $\frac{a}{b}=\frac{c}{d}=\frac{e}{f}=\frac{g}{h}$ prove that $\frac{a+c+e+g}{b+d+f+b}$

Solution.—The problem as it appears in the list is incomplete. It doubtless means to prove that in a series of equal ratios, any intecedent is to its consequent as the sum of all the antecedents is to sum of all the consequents.

Proof: $a:b=c:d=c:f=g:h$.

Taking products of means and extremes, $ad=bc$, $af=bc$, $ah=bg$, also $ab=ba$.

Adding, $ab+ad+af+ah=ba+bc+be+bg$.

Factoring, $a(b+d+f+h)=b(a+c+c+g)$.

Whence, $a:b=a+c+e+g:b+d+f+h$.

5. Prove that a factor may be transferred from the numerator to the denominator of a fraction or from the denominator to the numerator, provided the sign of its exponent is changed.

Solution.—Suppose we are to prove that $\frac{1}{a^m}=a^{-m}$.

Proof.— $\frac{1}{a^m}=\frac{a^n}{a^{m+n}}$; but $\frac{a^n}{a^{m+n}}=a^{-m}$.

∴ $\frac{1}{a^m}=a^{-m}$. Q. E. D.

6. Simplify $\sqrt{4a^3b}+\sqrt{25ab^3}-(a-5b)\sqrt{ab}$.

Solution.—$\sqrt{4a^3b}=2a\sqrt{ab}$. $\sqrt{25ab^3}=5b\sqrt{ab}$.

Adding, we have $(2a+5b)\sqrt{ab}$.

Subtracting $(a-5b)\sqrt{ab}$, we have $(a+10b)\sqrt{ab}$.

7. If a boatman can row 6 miles an hour with the current, and 2 miles an hour against it, how far down the stream can he row so as to return to his starting place in 12 hours?

Solution.—Let x=distance he can row. Then

$\frac{x}{6}+\frac{x}{2}=12$. Clearing, $4x=72$. $x=18$ miles.

8. Extract the square root of $83-12\sqrt{35}$.

Solution.—Let $\sqrt{x}-\sqrt{y}$ be the binomial whose square produced the general binomial surd,

$a-\sqrt{b}$. Solving, $x=\frac{a+\sqrt{(a^2-b)}}{2}$, $y=\frac{a-\sqrt{(a^2-b)}}{2}$.

Now the value of a in this particular problem is 83 and of $\sqrt{b}$ is $12\sqrt{35}$. Substituting these values in the above formulae, we have

$$x=\frac{83+[\sqrt{83^2}-(12\sqrt{35})^2]}{2}=63,$$

$$\text{and } y=\frac{83-[\sqrt{83^2}-(12\sqrt{35})^2]}{2}=20.$$

$\therefore \sqrt{x}-\sqrt{y}=3\sqrt{7}-2\sqrt{5}$, the required root.

9. Solve (eliminate by substitution):

$$\left.\begin{aligned}\tfrac{1}{3}x+3y+14&=0\\ \tfrac{1}{5}x+5y+4&=0\end{aligned}\right\}$$

Solution.—Transposing 1st equation,

$\frac{1}{3}x=-3y-14$

$x=-9y-42$

Substituting, $\frac{-9y-42}{5}+5y=-4$

Clearing, $-9y-42+25y=-20$; $16y=22$.

$y=1\frac{3}{8}$. $x=-54\frac{3}{8}$.

10. Solve: $\frac{x-3x^{-1}}{1+2x^{-1}}=3-x$.

Solution.—$\frac{x+3x^{-1}}{1+2x^{-1}}=\frac{x+\frac{3}{x}}{\frac{2}{1+\frac{}{x}}}$. $\therefore \frac{x+\frac{3}{x}}{\frac{2}{1+\frac{}{x}}}=3-x$.

Clearing and transposing, $2x^2-x=3$, $x^2-\frac{1}{2}x=\frac{2}{3}$.

Completing the square, $x^2-\frac{1}{2}x+\frac{1}{16}=\frac{25}{16}$.

Extracting $x-\frac{1}{4}=\pm\frac{5}{4}$. $x=\frac{3}{2}$ or -1.

LIST FOUR.

1. Factor $a^2x^2+100ax+99$, $x^{10}+a^{10}$, $5x^2-8xy+3y-5x+3y$.

Solution.—$a^2x^2+100ax+99=(ax+1)\ (ax+99)$; $x^{10}+a^{10}=(x^2+a^2)\ (x^8-x^6a^2+x^4a^4-x^2a^6+a^8)$; $5x^2-8xy+3y^2-5x+3y=(5x-3y)\ (x-y)-(5x-3y)=(5x-3y)\ (x-y+1)$.

2. Find the greatest common measure and the least common multiple of $4y^5+14ax^4-18a^3x^2$ and $24ax^3+30a^3x+126a^4$.

Solution.—Factoring the expressions we have $2x^2\ (x-a)\ (x+3a)\ (2x+3a)$ and $6a(2x+3a)\ (2x^2-3ax+7a^2)$. From the factors it can be seen that the greatest common measure is $2(2x+3a)$, and the least common multiple $6ax^2(x-a)\ (x+3a)\ (2x+3a)\ (2x^2-3ax+7a^2)=24ax^7+48x^6x^6+186a^4x^4-42a^3x^5+162a^5x^3-378a^6x^2$.

4. Simplify $\cfrac{x}{x-\cfrac{x+2}{x+2-\cfrac{x+1}{x}}}$.

Solution.—Reducing from a complex fraction to a simple, we have $\frac{x^2+x-1}{x^2-3}$.

3. What are literal equations? Simultaneous equations? Pure quadratic equations?

Answer.—Literal equations are those in which some or all of the known numbers are literal—as, $ax+3b=c$.

Simultaneous equations are those which are to be satisfied by the same set, or sets, of values of the unknown numbers—as, $x-12y=3$ and $x+4y=19$.

A pure quadratic equation is one which contains only the second power of the unknown quantity and known terms—as, $2x^2+3=35$.

5. Add $\sqrt[4]{16}$, $\sqrt[3]{81}$, $-\sqrt{-512}$, $\sqrt[3]{192}$, $-7\sqrt[6]{9}$.

Solution.—$\sqrt[4]{16}=2$.

$\sqrt[3]{81}=3\sqrt[3]{3}$.

$-\sqrt{-512}=8$.

$\sqrt{192}=4\sqrt[3]{3}$.

$-7\sqrt[6]{9}=-7\sqrt[3]{3}$

Adding results, we have 10.

6. (a) Express under the radical sign $x^{-1}y^{-1/2}z^{-2}$.

(b) Express with positive exponents $\dfrac{1-a^{-2}-y^{-2}}{1-x^{-3}y^{-2}+x^{-2}}$.

Solution.—(a) $x^{-1}y^{-1/2}z^{-2}=\dfrac{1}{x\,y^{1/2}\,z^2}=\dfrac{1}{\sqrt{x^2yz}}$

(b) $\dfrac{1-a^{-2}-y^2}{1-x^{-3}\,y^{-2}+x^{-2}}=\dfrac{1-\dfrac{1}{a^2}-y^2}{1-\dfrac{1}{x^3x^2}+\dfrac{1}{x^2}}$

7. Explain how an approximate ratio between two incommensurable quantities may be obtained.

Answer.—Two quantities that cannot be expressed in integers in terms of a common unit are said to be incommensurable, and the exact value of their ratio cannot be found. An approximate ratio, however, may be found as follows: Suppose the ratio

$$\frac{x}{y}=\sqrt{2}.\quad\text{Now }\sqrt{2}=1.41421356\ldots\ldots,$$

a value greater than 1.414215 and less than 1.414214. If, then, a millionth part of y is taken as a unit of measure, the value of $x\div y$ lies between 1.414213 and 1.414214 and therefore differs from either of these values by less than

.000001. By carrying the decimal further, an approximate value may be found that will differ from the true value of the ratio by less than a billionth, a trillionth, or any other assigned value.

8. Solve: $2x-\sqrt{xy}-3y=-4$
$3x+5\sqrt{xy}+2y=20$

Solution.—Multiplying first equation by 5 and adding to second equation, $13x-13y=0$

$$x=y$$

Substituting x for y in first equation,

$$2x-x-3x=-4$$
$$x=2$$
$$\text{and } y=2$$

9. Given d, the difference, n, the number of terms, s, the sum of an arithmetical progression, find formula for l, the last term.

Solution.—(1) $l=a+(n-1)d$
(2) $s=\frac{1}{2}n(a+l)$

Multiplying (1) by n, $nl=na+n^2d-nd$

Clearing (2), $-nl=na-2s$

Subtracting, $2nl=2s+n^2d-nd$

$$\frac{l=2s+n^2d-nd}{2n} = \frac{2s+nd(n-1)}{2n}$$

10. In a mile race A gives B a start of 44 yards and beats him by 51 seconds. In the second trial A gives B a start of 1 minute and 15 seconds and is beaten by 88 yards. Find the rate of each per hour.

Solution.—Let x=A's rate in yards per second.
y=B's rate in yards per second.

1 mile=1760 yards

$$\frac{1760}{x} = \frac{1760-44}{y}-51$$

$$\frac{1760-88}{x} = \frac{1760}{y}-75$$

Clearing and solving, $x=5\frac{13}{15}$; $y=4\frac{8}{9}$.

$5\frac{13}{15}$ yards per second=12 miles per hour, A's rate.

$4\frac{8}{9}$ yards per second=10 miles per hour, B's rate.

CHEMISTRY.

Answers by N. J. Riter, Science Teacher, Ironton High School.

LIST ONE.

1. Give Dalton's atomic theory.

Answer.—(1) Chemical elements consist ultimately of a vast number of very small, indivisible particles or atoms.

(2) Atoms of the same element have the same weight.

(3) Atoms of different elements have different weights.

(4) Chemical action is union or separation of the atoms of the elements.

2. What is the modern theory of solutions?

Answer.—According to the theory now generally held, electrolysis is not the splitting or tearing apart of molecules by the electric current. It is the carrying of electricity from one electrode to the other by ions. Dissolved or fused compounds are more or less dissociated into ions before the current of electricity is introduced, and the current flows simply because the ions are there to carry it. Ions are not atoms, but electrically charged atoms or groups of atoms. Thus, when Na Cl is dissolved in H_2O, much of the salt dissociates into the ions, Na and Cl; the Na ions are charged positively, and the Cl ions negatively. Now, when an electric current is passed into the solution, the ions move toward their proper electrodes, carrying the electric charges with them. In brief, the current sorts the ions, which in turn migrate with their charges. When the ions reach their respective electrodes, they give up their electric charges and assume their normal conditions. —Newell's Descriptive Chemistry.

3. Tell how each of the following is prepared in the laboratory: Chlorine, nitric acid. Write the reactions.

Answer.—Chlorine is prepared by heating a mixture of MnO_2 and HCl.

$$MnO_2 + 4HCl = Cl_2 + MnCl_2 + 2H_2O.$$

Nitric acid is prepared by heating concentrated H_2SO_4 with a nitrate, usually sodium or potassium nitrate.

At a low temperature and equal parts: $NaNo_3 + H_2SO_4 = HNO_3 + H\ Na\ SO_4$.

At a high temperature and excess of nitrate: $2NaNo_3 + H_2SO_4 = 2HNO_3 + Na_2SO_4$.

4. Define salt; acid salt; normal salt.

Answer.—A salt is the main product of the interaction of an acid and a base. Salts in which all the hydrogen atoms of the corresponding acid have been replaced by a metal are called normal salts. If some of the hydrogen atoms are not replaced by a metal, an acid salt is formed.

5. Explain the terms graphic symbol and percentage composition.

Answer.—Graphic or structural symbols indicate certain relations not shown by the empirical formula—as, water H—O—H; ammonia.

$$N\begin{cases} H \\ H \\ H \end{cases}$$

They are especially helpful in organic chemistry.

Since the formula of a compound expresses its composition, it is possible to calculate from the formula the composition in per cent. The formula of sulphuric acid is H_2SO_4, and its molecular weight is 98, i. e., 2+32+64. The calculations are most easily made by the following proportion:

2 : 98 :: X : 100, X= 2.04% of H.
32 : 98 :: X : 100, X=32.65% of S.
64 : 98 :: X : 100, X=65.31% of O.

By the same method the percentage composition of any compound may be calculated.

6. What is the difference between oxidation and combustion?

Answer.—When any substance combines with O to form a new compound, it is said to be oxidized, and the process is known as oxidation. This may be slow or rapid. When it takes place so rapidly as to be accompanied by heat and light, the process is called combustion.

7. Describe the manufacture of matches. Mention three different substances which are used as oxidizing agents in this manufacture.

Answer.—Soft wood is cut by machinery into the desired shape. The sticks are fixed in a frame, and one end is first dipped into melted sulphur and paraffin and then into the phosphorus mixture. The latter consists usually of different proportions of phosphorus, manganese dioxide, glue and a little coloring matter. Manganese dioxide may be replaced by other oxidizing agents, as potassium chlorate or potassium nitrate. These matches are the ordinary friction or sulphur kind. Safety matches contain no yellow phosphorus. The head of this kind is usually a colored mixture of antimony sulphide, potassium chlorate and glue, while the surface upon which the match must be rubbed to light is coated with a mixture of red phosphorus, glue and powdered glass.

8. Describe an experiment to indicate the ratio, by weight, of the elemtnts of water.

Answer.—The gravimetric composition of water is determined by passing dry hydrogen over copper oxide. The method depends upon the fact that many oxides, such as those of lead, copper and iron, when heated in a current of hydrogen, give up their oxygen, or, chemically speaking, these oxides are reduced to metals. By this reduction the oxygen of the oxide combines with the hydrogen, thereby forming water, which is collected in a weighted tube.

9. State the commercial uses of chlorine and iodine.

Answer.—Chlorine is used in making bleaching powder, as a deodorizer and as a disinfectant.

Iodine is for medicinal purposes, in making aniline dyes and in starch testing.

10. Write a reaction that results from passing steam over redhot iron; from heating a salt of ammonium with calcium hydroxid.

Answer.—$4\ H_2O + 3\ Fe = Fe_3O_4 + 4\ H_2$.

$2\ NH_4Cl + Ca\ (OH)_2 = Ca\ Cl_2 + 2\ NH_3 + 2\ H_2O$.

LIST TWO.

1. What is the standard of atomic weight? What do we mean when we say that the atomic weight of oxygen is 16?

Answer.—Hydrogen, being the lightest of substances, is

the standard of atomic weight. Its atomic weight is assumed to be 1, or by some as 1 micro-crith. There has long been a controversy whether H or O should be the standard; the latter is increasing in favor.

When we speak of the atomic weight of an element, therefore, we simply mean its density compared with hydrogen. If one cubic foot of H weighs a gram, one cubic foot of O will weigh 16 grams.

2. Why cannot atoms be weighed and atomic weights directly obtained?

Answer.—Atoms are invisible, and as weights so small as to weigh invisible things have never been made, atoms cannot be weighed. Atomic weight is merely an abstract idea, but something is necessary for comparison.

3. Describe a laboratory method of preparing carbon dioxide.

Answer.—Treating marble with concentrated hydrochloric acid. $Ca\ CO_3 + 2HCl = Ca\ Cl_2 + CO_2 + H_2O$.

4. State two ways in which the analysis of water may be accomplished.

Answer.—By electrolysis of water or by passing a current of steam through a tube containing charcoal or coke heated redhot. The steam is decomposed, the oxygen combines with the carbon of the coal, forming CO, and at the same time the hydrogen is set free.

5. Give the percentage composition of $H_2\ SO_4$.

Answer.—$H=1$; $S=32$; $O=16$. $\therefore H_2SO_4 = 2+32+64 = 98$. The H is 2-98 of the compound, or 2.04%; the S is 32-98 of the compound, or 32.65%, and the O is 64-98 of the compound, or 65.31%. (See question 5 in preceding list.)

6. At 70 cents per ounce, what is the value of the silver in ¼ pound of silver nitrate?

Answer.—$Ag=108$; $N=14$; $O=48$. $\therefore AgNo_3 = 170$. The Ag is 108-170 of ¼ pound = 1 77-85 ounces. $\$0.70 \times 1\ 77\text{-}85 = \$1.33\ 7\text{-}17$.

7. (a) Name three different oxides which will combine with water to form bases. Name the bases formed. (b) Is every alkali a base? Is every base an alkali?

Answer.—(a) Quicklime, barium oxide and strontium

with water will form calcium hydroxide, barium hydroxide and strontium hydroxide.

$$CaO+H_2O=Ca(OH)_2$$
$$BaO+H_2O=Ba(OH)_2$$
$$SrO+H_2O=Sr(OH)_2$$

(b) The more active bases are called alkalies; hence, every alkali is a base, but every base is not an alkali.

8. Why is it more easy to cleanse greasy hands with rainwater than with hard water?

Answer.—When the hands are washed with soap in hard water, the soap precipitates the salts in the water, of which a portion settles upon the skin, giving it an unpleasant feeling. Rainwater being comparatively free of these salts, no such precipitate is formed.

9. Give the chemical properties of chlorine.

Answer.—Dissolves in water; causes powdered antimony and arsenic to suddenly burst into flame; phosphorus melts at first and finally burns with a feeble flame; iron powder or brass wire when heated burn in chlorine; combines readily with hydrogen; does not combine directly with carbon. The power to bleach is the most striking and useful property of chlorine.

10. Complete the following:

(a) $Ba_2O+H_2SO_4=?$

(b) $2NHC_4Cl+Ca(OH)_2=?$

(c) $H_2SO_4+2NaNO_3=?$

(d) $2HNO_3+PbO=?$

(e) $3Fe+4H_2O=?$

Answer.—

(a) $BaO+H_2SO_4=BaSO_4+H_2O$.

(b) $2NH_4Cl+Ca(OH)_2=2NH_3+CaCl_2+2H_2O$.

(c) $H_2SO_4+2NaNO_3=2HNO_3+Na_2SO_4$.

(d) $2HNO_3+PbO=H_2O+Pb(NO_3)_2$.

(e) $3Fe+4H_2O=Fe_3O_4+4H_2$.

LIST THREE.

1. Give three reasons for considering air a mixture and not a chemical compound.

Answer.—(1) By accurate analysis we find that the proportion of O and N is not fixed, but varies between small limits.

(2) When O and N are mixed in the proportion to form air, the product is like air, but the act of mixing gives no evidence of chemical action.

(3) When air is dissolved in water, a greater proportion of O than of N dissolves. If the O and N were combined in the air, the dissolved air would have the same composition as air itself.

2. When you invert a bottle over a burning candle and hold it there till the flame is extinguished, what two gases, produced by combustion, will be found in the bottle?

Answer.—Water vapor and carbon dioxide.

3. State a common method of preparing hydrogen and give reason for the manner of collecting the gas.

Answer.—Treating zinc with dilute sulphuric acid.

$$Zn+H_2SO_4=ZnSO_4+H_2.$$

It is collected over water by upward displacement on account of its insolubility and lightness.

4. What is meant by water of crystallization? How would you determine the per cent. of water of crystallization in a given substance experimentally?

Answer.—Water of crystallization is the water combined with many salts in their crystalline form. This water is loosely but nevertheless chemically combined, for it is held in fixed and definite amount for each substance containing it.

The water of crystallization in a compound is usually determined by heating a known weight of the substance and noting the loss. To illustrate, put into a small porcelain crucible, the weight of which is known, about a grain of the substance, and weigh carefully. Support the crucible and with the Bunsen flame heat cautiously at first, increasing to red heat, cool slowly and weigh. Heat a second time four or five minutes and weigh again. Do this until two successive weighings show the same results; then calculate the per cent of water of crystallization.

5. Mention three organic acids. State the physical and chemical properties of one of them.

Answer.—Tartaric acid, $C_4H_6O_6$; citric acid, $C_6H_8O_7$; lactic acid, $C_3H_6O_3$; oxalic acid, $C_2H_2O_4$; acetic acid, $C_2H_4O_2$.

Acetic acid is a colorless liquid, having a pleasant odor

and a sharp taste. It is slightly heavier than water. It mixes with water and alcohol in all proportions, and, like alcohol, is an excellent solvent for many organic substances. Recently it has begun to replace alcohol as a solvent for many drugs. Acetic acid is used to prepare acetates, dyestuffs and other organic compounds, medicine, white lead, and in the manufacture of vinegar.

6. What, in general, is the effect of uniting an acid and a salt? Illustrate by reference to some experiment you have performed.

Answer.—The formation of a different salt and a different acid.

$$2NaCl + H_2SO_4 = 2HCl + Na_2SO_4.$$

7. How is limestone converted into quicklime? Quicklime into slaked lime? Give reactions.

Answer.—Quicklime is prepared on a large scale by heating limestone in a partly closed cavity or vessel.

$$CaCO_3 (heat) = CaO + CO_2.$$

Exposed to the air, quicklime becomes "air slaked," i. e., it slowly absorbs water and carbon dioxide, swells and soon crumbles to a powder. Lime and water combine violently and liberate considerable heat, as is often seen when mortar is being prepared. This operation is called "slaking," and the product is "slaked lime."

$$CaO + H_2O = Ca(OH)_2.$$

8. Explain the cleansing power of soap. How may you soften water of temporary hardness?

Answer.—The practical value of soap lies in the fact that on account of its slightly alkaline properties it has the power of uniting with the oil secreted by the glands of the skin and which holds the particles of foreign matter; this "dirt," therefore, may be removed by the mechanical action of the water. This also explains why frequent bathing with the application of strong soap will tend to cause the skin to chap by the removal of the oil which keeps it soft and pliable.

Heat decomposes acid calcium carbonate, and the hardness due to calcium carbonate is called temporary hardness, because boiling removes it.

9. What relation exists between the atomic weight and specific heat of an element?

Answer.—The atomic weight may be determined from the specific heat of elements in the solid state. Dulong and Petit found that the specific heat of the solid elements was inversely as their atomic weights; that is to say, the capacity for heat of masses of the elements proportional to their atomic weight was equal. The law briefly stated is, all elements in the solid state have the same atomic weight.

10. State and illustrate the law of definite proportions.

Answer.—Two or more elements, in uniting to form a certain compound, always do so in the same proportion by mass; hence, any given chemical compound always consists of the same elements in the same definite proportion by weight.

When sodium and iodine combine it is always in the ratio of 23 parts sodium to 127 parts iodine; sodium iodide is always so constituted. Red lead always consists of 618 parts lead to 64 parts oxygen; otherwise it would not be red lead. So each substance is what it is because it contains certain elements in certain proportions.

RHETORIC.

Answers by George Sprau, A. M., Teacher of English, Zanesville High School.

LIST ONE.

1. Write ten marks of punctuation and a general statement as to the use of each.

Answer.—(1) The period is used at the end of declarative sentences; (2) interrogation mark, after interrogatory sentences; (3) exclamation mark, after exclamatory expressions; (4) the comma is used to separate words in series; (5) the semicolon to separate members of a compound sentence that contains clauses set off by commas; also, before as, and namely; (6) the colon, to separate members of a compound sentence that have no close connection; also, after as follows; (7) quotation marks are used to inclose direct quotations; (8) the dash shows a sudden break in the thought of a sentence; (9) parentheses are used to inclose parenthetical expressions; (10) brackets are used to inclose a reference made in a sentence, or a whole sentence if made within a paragraph.

2. Illustrate loose, balanced, periodic and climatic sentence structure.

Answer.—Loose: The house where I was born stands over against the hill, shaded by trees.

Balanced: Talent is something; but tact is everything.

Periodic: Over against the hill, shaded by trees, stands the house where I was born.

Climatic: To respect one's self; to love and honor one's fellows; to appreciate and be kind to all living creatures—this is nobility in man.

3. What faculties of the pupil are most conspicuously tested in the writing of narrative themes? Descriptive themes? Argumentative themes?

Answer.—Narration tests the memory; description, the

power of observation, or the senses; argumentation, the reason.

4. Discuss the advantages and disadvantages of writing in the first person.

Answer.—Writing in the first person gives freedom and ease; in story writing it removes the necessity of telling how the information was acquired. Its chief disadvantage is that it attracts undue attention to the writer and becomes monotonous.

5. What is meant by mass in the paragraph; unity in the sentence?

Answer.—Mass in the paragraph means the arrangement of material so as to give most attention to most important parts of the subject.

Unity in the sentence means that the sentence shall contain but one thought, and that every word shall be related to the expression of that thought.

6. What suggestions would you make for the guidance of pupils in the matter of incorporating foreign words into the English vocabulary? Mention five foreign words or phrases which have become Anglicized.

Answer.—Never use foreign words unless you are sure that there are no English words or expressions that will exactly express your thought. Naive, tete-a-tete, cafe, hors de combat, apropos.

7. Define synecdoche, irony and hyperbole, and write examples of each.

Answer.—(1) Synecdoche names a part for the whole; as, "All hands to the ropes." (2) Irony expresses the contrary to what is meant; as, "No doubt but ye are the people, and that wisdom will die with you." (3) Hyperbole is an exaggeration; as, "Her eyes were bluer than violets; her face whiter than snow."

8. Discuss rhythm as a quality of prose style.

Answer.—Rhythm is that quality of prose style which gives it a smooth, gentle rise and fall of accent by virtue of the choice and arrangement of words and phrases. Rhythm should be aimed at in prose, but it should not attain the regularity of poetry. It should be natural and never purchased at the expense of clearness or strength.

9. Tell something of the sources and development of the English language.

Answer.—The English language has drawn from the languages of all the races that at different times have been masters of English soil. The Celtic was modified by the Anglo-Saxon; the resultant of these, by the Norman-French. Later, during the renaissance period, much Greek and Italian was introduced. From these causes the language has passed through various stages, each to some extent modifying its grammatical structure and vocabulary.

10. Distinguish between the literal and figurative use of a word. Illustrate.

Answer.—The literal use of a word is using it in its exact meaning; as, ice is cold. The figurative use of a word is using it to suggest a meaning by comparison; as, "Her manner toward me was very cold."

LIST TWO.

1. Make a list of ten subjects suitable for expositive themes.

Answer.—(1) Patriotism, (2) virtue and vice, (3) riches, (4) conduct, (5) happiness and pleasure, (6) success, (7) value of reading, (8) culture, (9) idleness, (10) carelessness.

2. Of what value to the student of rhetoric is paraphrasing?

Answer.—Paraphrasing helps the student to increase his vocabulary, and cultivates ease of expression by expressing the same thought in different words.

3. Neither John or I seem to clearly remember him saying that he had better stay at home.

Point out five faults in the above sentence and quote the rule of which each is a violation.

Answer.—(1) **Nor** is used with **neither.** (2) **Clearly** should come after remember. Do not place a modifier between the parts of an infinitive. (3) The antecedents of the pronouns are not clear. There should be no doubt as to the antecedent of a pronoun. (4) **Saving** should be preceded by the possessive. This is an idiom that good

usage sanctions. (5) **Had better** is an idiom not yet fully accepted. Better use **should.**

4. Many **idioms,** although contrary to strict grammar or **logic,** are doing good service in the English language, and are by no means to be classed as **solecisms.**

Define the words in black type.

Answer.—Idioms: Expressions having a peculiar meaning in the language.

Grammar: The science which treats of the principles of language, the forms of speech and their relation to each other.

Logic: The science of reason and thought.

Language: Spoken and written media of expression and communication.

Solecisms: Violations of the rules of grammar. In a broader sense, solecisms include any violations of the principles of language.

5. Write at least five expressions that come under the class indicated by the quotation used in the last question.

Answer.—(1) Get ahead of; (2) take place—in the sense of occurring; (3) get rid of; (4) get used to; (5) a great deal.

6. Illustrate loose, periodic and balanced sentence structure.

Answer.—Loose: The little birds flew over the river, across the fields, to their home in the woods.

Periodic: Little by little, day after day, and week after week, with no thought save that of the beauty it was to reveal, the little flower pushed forth its bloom.

Balanced: To know what is right is wisdom; to do it is nobleness. (See question 2 in the preceding list.)

7. To what general rules of construction should all compositions of the short story type conform?

Answer.—All compositions should conform to the general rules of unity, mass and coherence.

8. Discuss the relative importance of force, beauty and clearness as qualities of prose style.

Answer.—The first quality of prose style is clearness. Unless the style is clear, any other qualities cannot be of much significance. After clearness come force and beauty.

Beauty is the highest quality that gives style a place as art. Any style may be good without beauty, but it will not rank high as a work of art.

9. Distinguish among simile, metaphor and analogy.

Answer.—Simile makes a direct comparison; as, "He runs like a deer."

Metaphor compares by giving to an object the name or attributes of something to which it is compared; as, "Life is a river."

Analogy is based upon a likeness of relation; as, "Learning is to the mind what light is to the eye."

10. What kind of a pause in thought is indicated by the colon? The semicolon? The dash? Illustrate the use of each.

Answer.—In many cases good writers use the colon and semicolon to indicate the same construction. However, in general the colon indicates a pause next to the period. The semicolon indicates a pause next to a colon. The dash indicates a sudden break or transition in thought.

(1) "Mohammed died with these words on his lips: 'O God, pardon my sins!'"

(2) There are many ways of sinning; as, stealing, lying, and killing.

(3) The boy is strong, intelligent, virtuous—everything but beautiful.

LIST THREE.

"The ultimate object of all schooling, of the weary grind in the multiplication table and the principles of grammar, is not merely to acquire useful facts, but to train the mind to observe keenly and reason soundly. Though arithmetic and reading are immediately helpful in daily affairs, even these bread-and-butter studies are equally profitable as a means to an end—mental discipline. English composition is no exception. True, ability to express one's self clearly and interestingly is a great assistance in the professions, in business and in social intercourse, but at the same time a course in English composition serves the more remote and important end, for drill in writing is a drill in observing keenly and reasoning soundly."

1. The above is a paragraph of introduction. What subject is it intended to introduce? What, if any, is the topic sentence? (10 credits.)

Answer.—The subject introduced by the paragraph, broadly stated, is English composition. However, only certain phases of this subject may be treated.

Strictly speaking, a topic sentence should be a brief statement of the whole subject. The real topic sentence need not be expressed, and in this paragraph is not expressed. The topic sentence might be stated thus: While English composition serves as drill in writing, its highest purpose is training in thought.

2. By what means is the paragraph developed? (10 credits.)

Answer.—The paragraph is developed by stating a broad general truth, then by detailed explanatory sentences leading to the more particular thought under consideration.

3. Classify each sentence as loose, balanced or periodic. State two reasons why the paragraph gains in effectiveness by the shortness of the third sentence. (15 credits.)

Answer.—(1) Periodic; (2) periodic; (3) periodic—this sentence might be classified as loose. Strictly speaking, all short sentences may not always admit of sharp distinctions with reference to this basis of classification. (4) Balanced.

The third sentnece is effective; first, because it abruptly introduced the special subject for consideration; second, it is so short that all that has been said in the preceding sentences is immediately applied to English composition.

4. Are transitional words used? If so, what are they, and how do they preserve the continuity of the thought? (10 credits.)

Answer.—Transitional words, as we commonly use the term, are words through which the thought gradually shifts from one sentence to the other. The more important words of this kind in the paragraph given above are "though" and "even" in the second sentence, "though" admitting what has been said before, "even" adding to this meaning; "exception" in (3) keeps before the mind what has been said; "true" in (4) admits what has gone before and leaves the way clear for something more definite.

5. Compress as much of the thought of the paragraph as possible into a single balanced sentence of not more than thirty words. (10 credits.)

Answer.—While English composition, like all educational work, aims at practical mastery of the subject at hand, yet its highest purpose is the development of thought power.

6. Write an original and suitable introduction (of not less than 100 nor more than 200 words) upon the same subject as that of the paragraph quoted above. (25 credits.)

Answer.—No answer can be given to this requirement. The work depends upon individual ability.

7. What do you consider the most important quality of style? Mention some important directions to be followed in securing this quality. (10 credits.)

Answer.—Clearness. Have clearly in mind what you wish to say. Avoid very long sentences. Keep modifiers as near as possible to the words they modify. Be careful about pronouns and antecedents. Let the transitional words and phrases and the explicit references be so marked that the progress of thought cannot be broken or mistaken. Avoid ambiguous words.

8. Illustrate five of the following: Obsolete word, metonymy, trope, syllogism, ellipsis, barbarism.

Answer.—Metonymy: "He comes from heathen lands."

Trope: "The lion shall lie down with the lamb."

Syllogism: "All men are mortal. John is a man. John is mortal."

Ellipsis: "Who steals my purse steals trash."

Barbarism: "I saw your ad in the morning paper."

BOTANY.

Answers by Principal L. S. Hopkins, A. M., Massillon, Ohio.

LIST ONE.

1. Name three functions of roots.

Answer.—Roots serve as storehouses of food, to hold the plant in the ground and to absorb moisture.

2. Describe an exogenous stem.

Answer.—Exogenous stems grow by the addition of woody tissue to the outside. A cross section of such a stem would show a small central portion of pith, around this the woody tissue, then the cambium and the bark.

3. What conditions of light, heat and moisture are best suited to the germination of plants?

Answer.—"The conditions required for germination are abundant moisture, suitable temperature and a supply of oxygen (which means access of air). Seeds vary greatly in the amount of heat necessary for germination, as may be inferred from the fact that some seeds germinate in early spring, or even on the melting snowfields of Alpine regions, while others need the heat of the tropics."—Coulter.

4. Name three plants whose flowers are perfect, regular and complete; three plants which grow from bulbs; four wild plants which flower in the spring.

Answer.—(a) Hyacinths, lilies, wild garlic. (b) Trilliums, anemones, violets, blood root. (c) Buttercups, twinleaf, May-apple.

5. Describe in detail the structure of a leaf and state the uses of the different parts.

Answer.—In a general way the leaf consists of epidermis, veins and mesophyll. The epidermis covers the leaf, is thin, transparent, with little or no green color and is made up of cells, the most noticeable of which are the stomata. The mesophyll is the mass of green tissue which makes up the body of the leaf. It contains the chloro-

plasts and palisade tissue. The veins form the frame-work of the leaf and conduct material to and from the working cells.

6. Explain how respiration and circulation are accomplished in plants.

Answer.—The external indications of respiration are the absorption of oxygen and giving out of carbon dioxide. It does not depend upon light or chlorophyll, for it goes on in darkness and in plants that have no chlorophyll. It goes on in every living part of the plant. Respiration is necessary to all plants and supplies the energy which enables the living substance to do its work.

Circulation, as the term is ordinarily employed, does not exist in plants. There is a streaming motion of the protoplasm in certain cells to which the term is sometimes applied. It is customary to speak of the circulation of the sap, etc., but true circulation does not exist.

7. Define aestivation, node, perianth and epiphyte.

Answer.—Aestivation refers to the manner in which the parts of the flower are folded up before expansion. Node is that part of the stem which normally bears the leaves. Perianth is a term used to include or designate both the calyx and the corolla. An epiphyte is an air-plant, a plant which grows upon another plant but not parasitically.

8. To what order, genus and species does each belong: Squash, raspberry, clover, tomato, hops?

Answer.—There are many different species of clover, raspberries and squashes.

Leguminosae-trifolium-pratense L.—common red clover.

Rosaceae-rubus-occidentalis L.—common black raspberry.

Cucurbitaceae-cucurbita-melopepo L.—summer squash.

Solanaceae-lycopersicum-esculentum Mill.—tomato.

Urticeae-humulus-lupulus L.—common hop.

9. Mention the different methods of pollination in plants.

Answer.—Flowers are pollinated by the wind, insects, birds or are self-pollinated.

10. Name and describe each of the three parts of the bark of a year-old stem.

Answer.—The epidermis, which corresponds to the corky

layer in older stems, is brownish in color or sometimes almost colorless. Under the epidermis is the cortex, a greenish layer of young bark; beneath this and lying next to the woody tissue is the bast, a layer of tough, stringy fibers.

LIST TWO.

1. How are buds protected? What are naked buds? Where are they usually found?

Answer.—Buds are usually protected by bud scales. In some cases, as that of the buckeye, these scales are held down by a sticky substance which is impervious to water. Naked buds are those in which no protective scales or any other special covering has been developed. Although not entirely lacking in temperate flora, naked buds are a characteristic of tropical plants. They may be found anywhere on the stem.

2. Give an example of each of the following fruits: Akene, berry, drupe, pome, capsule.

Answer.—Akene: Strawberry, buttercup. Berry: Tomato, grape. Drupe: Peach, plum. Pome: Apple. Capsule: Violets.

3. Distinguish between fibrous and fleshy roots. Illustrate the occurrence and use of aerial roots.

Answer.—The thread-like roots of grasses are fibrous, while the thickened roots of beets, turnips, etc., are fleshy roots. Aerial roots are those which are formed in the air either to help the plant maintain itself, as in the corn, or to absorb nourishment, as in the orchids.

4. Name the parts of a complete flower and give the use of each part.

Answer.—A complete flower has all the floral organs, viz., calyx, whose function is protection; corolla, which is ornamental and by its color attracts insects; stamens, which produce the pollen; and pistil, in which the fertilized ovules are developed.

5. Explain cross-pollination.

Answer.—A flower is said to be cross-pollinated when it is fertilized by pollen from another plant of the same species.

6. How do plants breathe? What do they take in and give off in respiration?

Answer.—Plants breathe by means of the stomata. They take in oxygen and give off carbonic acid gas.

7. Describe ferns as to (a) leaves, (b) reproduction.

Answer.—The fern leaf, technically called the frond, includes all the expanded green portion borne on a single petiole. It may be entire or very finely cut and divided. Ferns reproduce in three ways: (1) by root-stocks; (2) by bulblets or buds, as in the case of the bulblet-bladder fern; (3) by means of spores, which produce prothallia, whose under surface bears antheridia and archegonia, the cell contents of which unite to produce the new plant.

8. Name one plant which is epiphytic, parasitic, saprophytic, xerophytic, carnivorous.

Answer.—Epiphytic, orchids; parasitic, dodder, rusts; saprophytic, mushrooms, bacteria; carnivorous, Venus' fly-trap.

9. What is the primal distinction between the two great classes of plants, cryptogams and phenogams?

Answer.—Phenogams bear flowers and reproduce by means of seeds. Cryptogams have neither blossoms nor seeds and reproduce by means of spores.

10. Illustrate by diagram or describe the structure of a coniferous stem.

Answer.—Limited space will not permit a detailed answer to this question. Coniferous and dicotyledonous stems are practically the same. To the former belong the various species of pines, hemlock, etc.; to the latter most of our common forest trees such as the oak, beech, hickory, maple, etc., as well as most herbaceous plants. Monocotyledonous stems increase in length, but very little in diameter. Coniferous stems increase in length and diameter. The annual increase in diameter enables the stem to put out more branches with an increased number of foliage leaves each year and so increase its capacity for leaf-work. A cross-section of such a stem would in a general way show the pith in the center surrounded by woody tissue or vascular cylinder, which in turn is enclosed by the cortex with the epidermis around all.

GENERAL HISTORY.

By C. L. Martzolff, B. Ped., Department of History, Ohio University, Athens, O.

1. Contrast the physiography of Greece with that of Egypt and Assyria.

Answer.—The most peculiar fact of the Grecian peninsula is the great extent of its coast as compared with its area. The great indentations almost cut it into three distinct portions, which are commonly known as northern, central and southern Greece.

Lower Egypt is a vast plain; Upper Egypt a narrowing valley, being in its widest part less than eleven and its narrowest only five miles in width.

Assyria was a part of the lowland plain of southwestern Asia, lying east of the Tigris and west of the Median Mountains.

2. What great contrast between the history of Egypt or Assyria and that of Greece?

Answer.—The physiography of the most of Greece affords but little opportunity for internal growth; consequently the people were forced to go beyond its limits to find occupation and livelihood. The irregular coast offered many harbors which aided in making the Greeks a commercial nation and thus adding to their civilization. These conditions would tend to make them a hardy, self-reliant people in which democratic ideas would develop and the highest degree of culture made possible. On the other hand the fertility of the Nile valley made Egypt sufficient unto itself. While a great deal of civilization grew there, yet it was a country of caste. Slavery is more possible in a flat, fertile agricultural country than in a rugged, mountainous country.

3. Describe the constitution of Athens before the time of Solon. What changes were introduced by him?

Answer.—Aristotle, in speaking of the Athenian constitution, as revised by Draco, says: "The poor with their wives and children were in servitude to the rich. A few proprietors owned all the soil and the cultivators were liable to be sold as slaves on failure to pay their rent. Debtors, too, as a guarantee of their obligations, were liable to forfeit their freedom on failure to satisfy their creditors. And now when the narrowness of the constitution and the oppression of the many by the few had ended in the outbreak of war between the nobles and the commons, they concurred in the election of Solon as mediator and dictator."

Solon enacted four laws to relieve the condition of the peasants: A law cancelling all debts, secured by mortgages on land; a law making slavery for debt illegal; a law prohibiting a man from mortgaging himself or his family for security for debt; a law fixing the maximum number of acres which any man might hold. Every man was required to teach his son a handicraft, in order to give each person an equal chance. Each of the four classes into which the population was divided was admitted to a share of the government. Popular law courts were also established.

4. Define or describe each of the following terms used in connection with Roman history: Consul, dictator, tribune of the plebs, assembly of the tribes, twelve tables.

Answer.—Two magistrates called Consuls were annually elected by the Romans. To them were entrusted practically all of the power formerly held by the King. They were both commanders-in-chief of the army and civil magistrates. They were absolutely equal in authority and either might annul the acts of the other.

The Dictator was provided for to prevent deadlocks and to give the government unity in times of great danger when the Consuls could not agree. This Dictator might be nominated by either Consul and he would have complete control of affairs for not longer than six months. At first there were two tribunes, but their number was eventually increased to ten. These magistrates were to protect the plebians against the exactions of the Consuls by interfering

in lawsuits brought against them, and exempting them from military duty. The tribunes were protected in person by the Sacred Law which made it a crime, as against the gods if any indignity were offered them.

In the city of Rome there were four tribes and in the country twenty-six, consisting of land owners without respect to rank. The meeting-place for these thirty tribes was in the forum, where they had practically all the powers of self-government, for they elected their magistrates and levied the taxes.

In 451 B. C. ten men, the Decemviri, were chosen to codify the Roman law. This body of men prepared ten tables, or tablets. But there had been a part of the law omitted and a new decemviri, with Appius Claudius at the head, prepared two more tables.

5. Under what title and with what powers was Caesar ruling Rome just before his death? Describe the work he did for Rome.

Answer.—Caesar had, by a servile senate, been made dictator and censor for life. In this supreme position, he reformed the calendar, which with one exception is used yet today. He codified the Roman law, and projected a Latin and Greek library. The course of the Tiber was to be changed, that marshes might be drained. In short, his aim was to make a great Mediterranean empire instead of a narrow municipal Rome.

6. Describe the so-called "Fall of Rome."

Answer.—In the fifth century the Germanic invasions of Rome began. These barbarians came into the empire without any definite idea as to how or where they were going to settle. But the repeated attacks served by mere attrition to finally overcome the rapidly disintegrating forces of the empire. In 476, Romulus, the last of the emperors, was deposed. The Roman Senate, in a letter to Zeno, emperor of the East, surrendered the claim of their country to imperial rank, consented to acknowledge Constantinople as the seat of government for the world, and the Empire of the Caesars was at an end.

7. Name the leading commercial cities of Southern Europe in mediaeval times. What led to their rapid growth? What caused their decline commercially?

Answer.—Venice, Genoa, Pisa, and Florence. Their commercial importance was due to their immense trade with the far East, and their decline in a great measure was caused primarily by the Fall of Constantinople in 1453, which closed their avenue to trade, and the absorption of the municipal authority of these "city states" by the newly-established modern nations.

8. Tell what you know about the services of Peter the Great to his country.

Answer.—In order to give Russia access to the sea it was necessary to wrest the Euxine from the Turk and the Baltic from the Swede. The second service that this remarkable man did for his country was the introduction of the ideas, customs, arts and industries of Western Europe. In order to do these things he sent Russian youth to other countries to learn, and he himself learned the art of ship-building in Holland. Upon his return to his country he put into practice what he had learned and in addition reorganized the army after the western ideas. He also issued a new coinage, introduced schools, built factories, constructed roads and canals, established a postal system, opened mines, and reformed the government that the people might have some voice in it.

9. Sketch the chief events in the life of Napoleon.

Answer.—In the siege of Toulon, 1793, Napoleon had already established a reputation for military power. The French Convention, in fighting the Parisian rebellion of 1795, found that the young Corsican was the man that trained the guns that scattered the mob of forty thousand. He next is charged with the Italian campaign, compels the Austrian monarch to come to his terms, and looks forward to a French empire in the Orient. The Directory is glad to accede to his Egyptian campaign, for they already fear lest he might be another Caesar. Under the shadow of the Pyramids he wins a signal victory over the Mamelukes and Lower Egypt is his. The Directory at home was having trouble. The royalists were getting bold and the mob was bolder. At this juncture, Napoleon appeared upon the scene, amid the acclaims of the people, broke up the Council of the Five Hundred, and was master of France.

He gave to the people a new constitution and was made the First Consul, or what was in reality military dictator He turned his attention to Austria, defeated them at Marengo, and Hohenlinden, and that nation was willing to make peace.

As the head of the empire, he made many internal improvements. The greatest achievement, however, was the revision of the laws in a new code that has done more for the growth of equal rights in Europe than any other one thing.

Now he becomes Consul for life, and it is only a step further until the crown is placed upon him in Notre Dame. Europe was now in arms against him. Coalition after coalition was formed. It was the war of the giants. Russia and Austria fell before his military genius at Austerlitz. Germany was reorganized, and the Holy Roman Empire of Charlemagne, which was already dead, was buried without "benefit of clergy."

Prussia was next to feel the iron heel of this wizard of war and statecraft. At Jena, the army of the once great Frederick was annihilated, and the victorious army marched to the palace of Berlin. At Tilsit, he sat with Czar Alexander on a raft and together divided the world between them. He proceeded to carry out the program. Europe was farmed out to the Bonapartes—Jerome was king of Westphalia, Joseph was placed upon the royal bench of Spain, to Murat was given Naples, and Louis wore the crown of Holland. The empire of the Corsican adventurer spread over Europe. He was King of Italy, Protector of the Confederation of the Rhine, and Mediator of Switzerland. Austria and Prussia were subject to his will, and Russia and Denmark were his allies.

Then came the Battle of the Nations at Leipzig, and Napoleon lost, and was condemned to spend his time on the Island of Elba. In less than a year this soldier of fortune had escaped to the continent. The Old Guard met him with transports of joy and went down with him on the field of Waterloo, and would gladly have shared with him his exile on volcanic St: Helena.

10. Give a brief history of the Wars of the Roses.

Answer.—The wealth and power of the English nobility had become great. Richard, the Duke of York, was the leader of one of the noble factions opposed to the coterie of the king, Henry VI. This Duke of York, by two direct lines of descent from Edward III, had, as far as heredity is concerned, a better right to the throne than the incumbent himself. Richard laid claim to the crown, and his party adopted the white rose as the emblem of its cause. The king, who had descended from the Duke of Lancaster, John of Gaunt, adopted the red rose. It was a family contest for the throne of England, which resulted in the Yorkists putting Edward IV, the son of Richard, upon the throne.

PHYSICS.

Answers by Principal Lee A. Dollinger, Sidney (O.) High School.

LIST ONE.

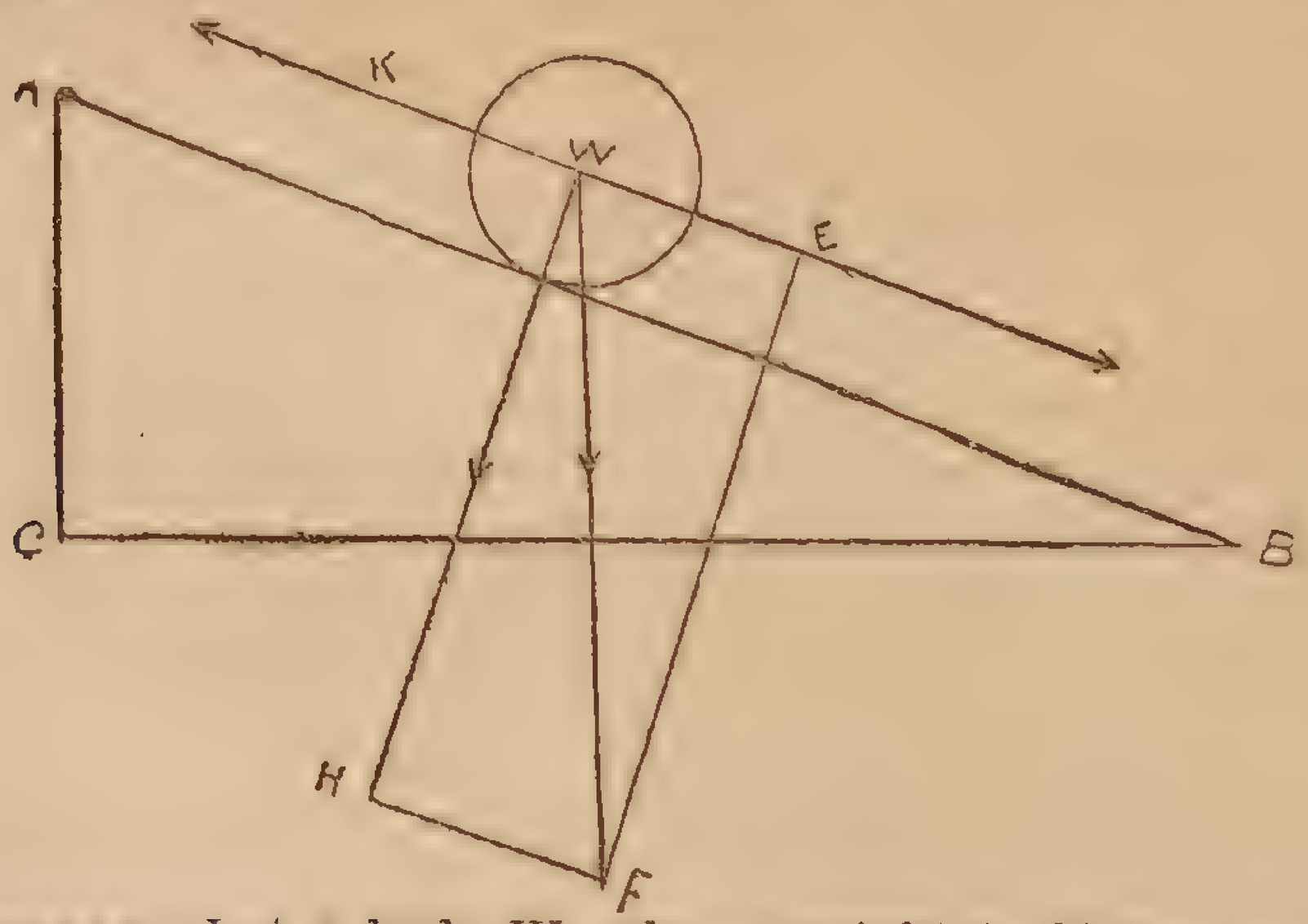
1. Describe an experiment illustrating a physical change; one illustrating a chemical change.

Answer.—In a physical change the composition of the substance changed is not altered. The freezing of water is a good illustration. In a chemical change the composition of a substance is altered. The burning of a match, the rusting of iron and the souring of milk are examples of chemical changes.

2. Why do some liquids rise in capillary tubes, while others do not?

Answer.—Liquids rise in capillary tubes when their molecules have a greater attraction for the sides of the tube than they have for each other. Liquids will not rise in capillary tubes when their molecules have a greater attraction for each other than they have for the sides of the tube—e. g., mercury.

3. If a force of 8 lbs. applied parallel to an inclined plane supports a weight of 20 lbs., what is the pressure on the plane?



Answer.—Let a body W. whose weight is 20 lbs. be sup-

ported on a smooth inclined surface ab. by a force of 8 lbs. applied parallel to the plane ab. Draw we. equal to kw. and parallel to ab. and complete the rectangle whfe. Then wh. and we. are components of wf., and wh. represents the pressure on ab., or wh.$=\sqrt{(20^2-8^2)}$ or 11.6+.

4. Upon what does the intensity of light depend?

Answer.—The intensity of light received by an illuminated body depends upon its distance from the source of light.

5. How may the candle power of any source of light be measured?

Answer.—The candle power of any source of light may be measured by means of a photometer.

6. Describe an experiment illustrating the elasticity of gases.

Answer.—Gases possess perfect elasticity of volume. The manipulation of the common popgun is an experiment illustrating the elasticity of air.

7. State the principle and uses of the galvanometer.

Answer.—A galvanometer is an instrument constructed for the purpose of determining the strength of an electric current. It depends upon the principle, the greater the strength of current the greater the deflection of the indicator or needle of the instrument.

8. Define latent heat; friction; vaporization.

Answer.—Latent heat is heat which disappears or becomes concealed in a body while producing some change in it other than rise of temperature, as fusion, evaporation.

Friction is the resistance which a moving body meets with from the surface on which it moves.

Vaporization is the process of changing into a gaseous form any substance which is ordinarily in the form of a liquid or solid.

9. Why is sound at a distance made distinctly audible by means of a speaking trumpet?

Answer.—Sound at a distance is made audible because by means of the speaking trumpet the sound waves are propagated only in one direction. Sound waves are supposed to expand as a spherical shell.

10. In taking the temperature of a vessel of water with

both a Centigrade and a Fahrenheit thermometer, the Fahrenheit reading was three times the Centigrade reading. What was the temperature of the water?

Answer.—In $\frac{F-32}{180} = \frac{C}{100}$, put $F=3C$; then $\frac{3C-32}{180} = \frac{C}{100}$; from which $C=26.27°$.

LIST TWO.

1. Give Newton's three laws of motion.

Answer.—(a) Every body continues in its state of rest or of uniform motion in a straight line unless compelled to change that state by an external force. (b) Every motion or change of motion is in the direction of the force impressed and is proportionate to it. (c) Action and reaction are equal and opposite in direction.

2. What is inertia? Which of Newton's laws may be called the law of inertia?

Answer.—A body of matter resists any attempt to change its state of rest or motion. This is a general property of matter called inertia. The first of Newton's laws as given in the first question is a brief statement of the principle of inertia and may be called the law of inertia.

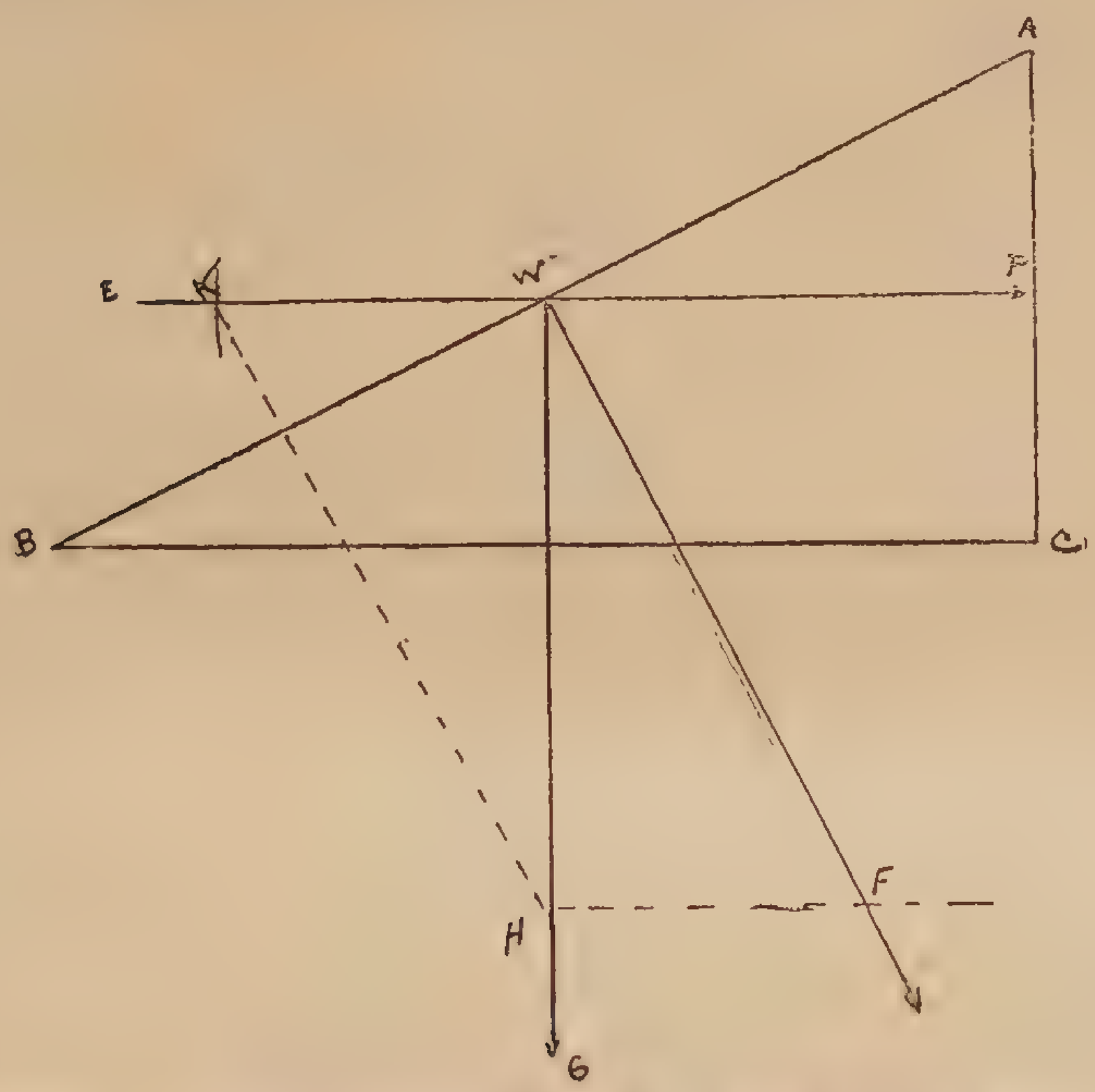
3. For what, and how, is a manometer used?

Answer.—A manometer is an instrument used to determine the degree of exhaustion of the air or any gas from a closed vessel. It is made in two forms, the open and the closed. The open manometer consists of a bent glass tube held in a verticle position by a frame having a graduated scale between the two arms of the tube. The short arm is attached to the vessel containing the gas after mercury or some other suitable liquid has been poured into the manometer. Before the gas is turned on the liquid will stand at the same height in both arms, but as soon as the gas is turned on the pressure is shown by the difference in the level of the columns.

4. Under standard conditions, a certain mass of gas occupies a volume of 66.3 cc. What volume will it occupy when the temperature is 25° C. and the pressure is 752 mm. of mercury?

Answer.—First, suppose the pressure to change from 776 cm. to 752 cm. of mercury. The gas will expand, the two volumes being in the ratio of 752 to 776, or the volume will be 97-94 times 66.3 or 68 391-940 cc. The expansion will be 25-273 of the volume at 0 or standard. The volume will be 125-273 times 68 391-940 cc., or 74.6 cc.

5. Draw the diagram and deduce the formula for the mechanical advantage of the inclined plane when the force is applied parallel to the base of the plane.



Answer.—In this figure BC is the base of the plane and AC the height. If the force P, which keeps the weight W in position and acts parallel to the base BC the components may be found by construction, and we have WK : WH= CA : CB. ∴ P : W=H : B.

6. Explain what is meant by the specific heat of a substance.

Answer.—By specific heat is meant the ratio between the quantity of heat required to raise the temperature of a certain mass of any substance one degree, to the amount required to raise the same mass of water one degree.

7. Compare the velocity of sound in air and in water. Why the difference?

Answer.—The velocity of sound in air is 1090.5 ft., or 332.4 M in air per second. In water it is 4.3 times as much. The velocity of sounds in liquids is greater than in gases, owing to the fact that their coefficient of elasticity in proportion to their density is much greater.

8. What is the difference between a real and virtual image? Why do plane and convex mirrors form only virtual images?

Answer.—A real image is one that can be caught on a screen, while a virtual image can not, but can be seen in a mirror. An image seen in a plane mirror is always virtual. This is because the rays from a point are diverging before reflection and will continue in the same relation to each other after reflection. The location and character of images in convex mirrors may be found by construction as in concave mirrors. It is found that the image is virtual. The effect of a convex mirror is to make convergent rays less convergent, parallel, or divergent; parallel rays, divergent, and divergent rays more divergent.

9. Describe an experiment that illustrates positive and negative electrification.

Answer.—Rub a glass rod with silk and suspend it. Excite a second glass rod and hold it near one end of the suspended one. The suspended rod will be repelled. Bring near the suspended rod of glass a rod or stick of sealing wax excited by friction with flannel. The suspended glass rod will now be attracted. The experiment shows that there are two kinds of electrification—rubbing glass with silk, positive, rubbing sealing wax with flannel, negative.

10. What E. M. F. will maintain a current of 1.5 amperes through a resistance of 80 ohms?

Answer.—By Ohm's law, $C = \frac{E}{R}$, where C is the strength of the current in amperes. E is the E. M. F. in volts, and

R is the resistance in ohms. When any two of these quantities are given, the third may easily be found.

C=1.5. R=80. 1.5=R÷80. ∴ E=120 volts.

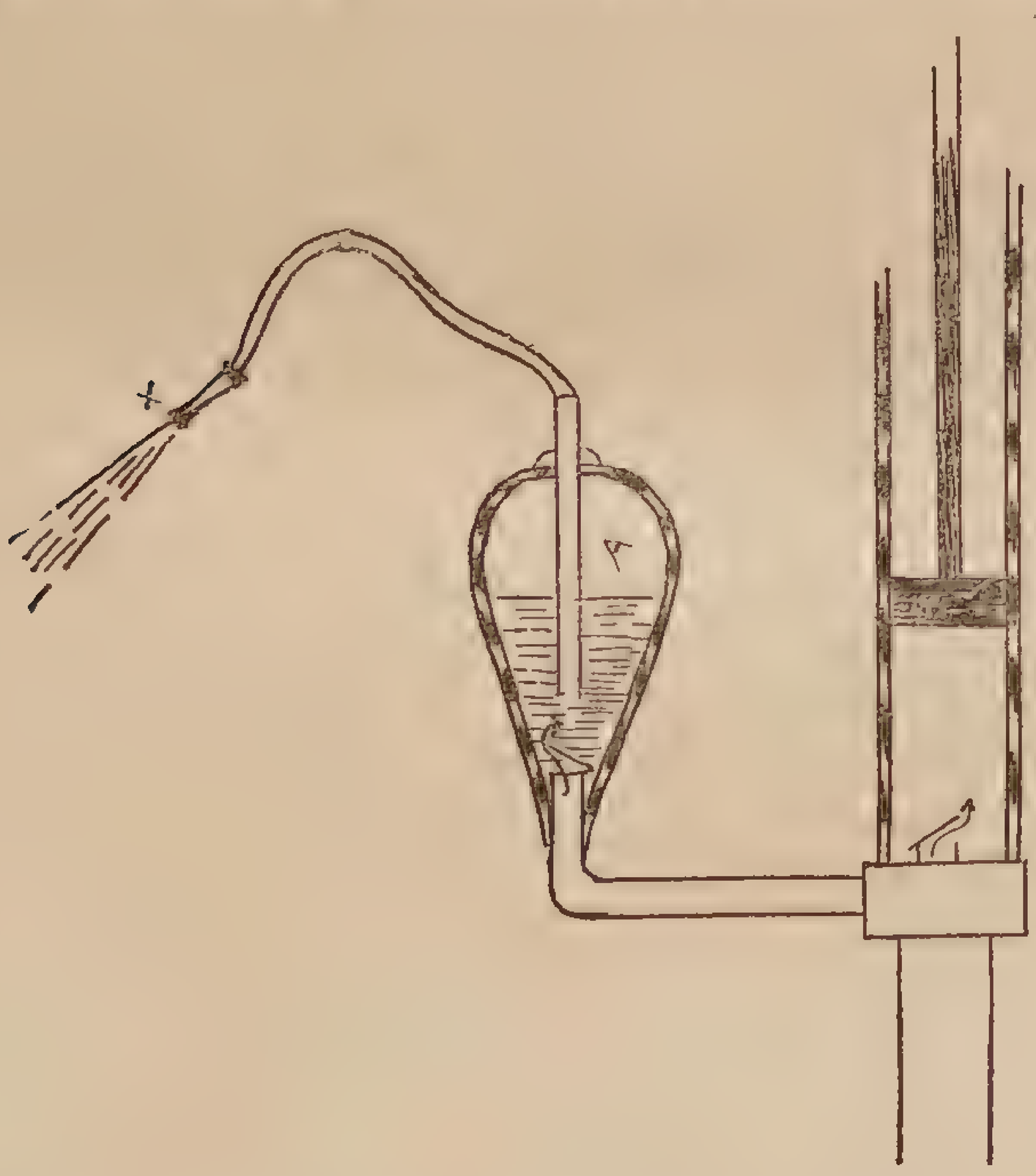
LIST THREE.

1. What principle did Archimedes discover with regard to immersed bodies?

Answer.—A body immersed in a liquid apparently loses in weight an amount equal to the weight of the liquid displaced.

2. Draw a diagram showing a longitudinal section of a force pump. Of what use is the air chamber?

Answer.—The elasticity of the air in the air chamber A forces the water out at X in a steady stream, though it comes in only during the downward stroke of the piston.



3. A ball rolling along the ground is uniformly retarded at a rate of 4m. per second. Its velocity at the start is 20m. per second. How long will it roll? How far will it roll?

Answer.—It will roll for 5 sec.

$S = \frac{1}{2}$ at^2. $A = 4$. Then $S = 50$ m.

4. What is diffusion? Describe an experiment to illustrate the diffusion of gases.

Answer.—The intermingling of gases or liquids of different densities is known as diffusion. Fill two glass jars with oxygen and hydrogen respectively and cover each with a glass plate. Invert the jar of hydrogen and place it over the jar of oxygen. Remove the plates and let the jars stand for about fifteen minutes. Apply a lighted taper to each jar. An explosion will follow, showing that the gases have mixed.

5. Why is it necessary to mix salt with ice in making ice cream?

Answer.—Pounded ice and coarse salt, when mixed together, exert upon each other a molecular action which results in both solids becoming liquefied. A double absorption of heat occurs, and if enough of the mixture is placed around cream the cream is frozen.

6. What factors affect the velocity and intensity of sound waves? A flash of lightning is seen, and 6 seconds later the thunder is heard. How far away was the lightning, the temperature being 24° C.?

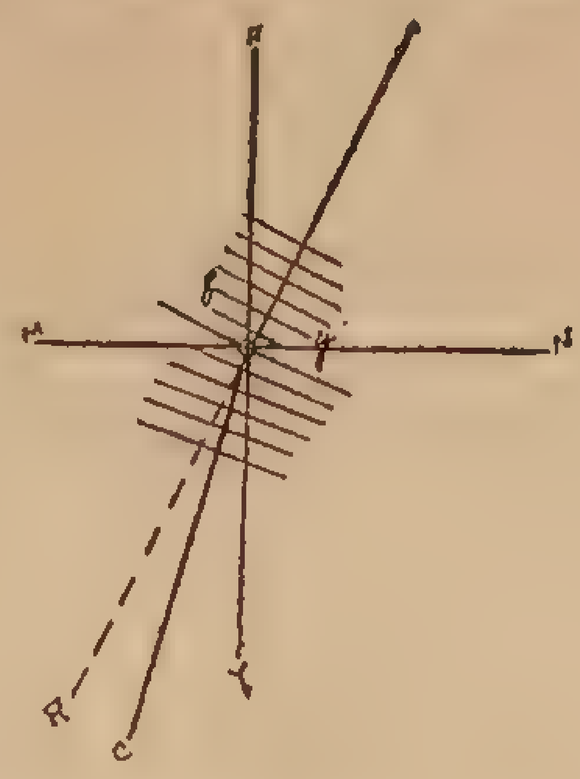
Answer.—The elasticity and density of the different media through which sound waves pass affect their velocity and intensity. Velocity of sound at 0° C. is 1090.5 ft. per sec.; it increases about 2 ft. per degree Centigrade: hence at 24° C. the velocity would be 1090.5 + 48, or 1138.5 ft. per sec. 1138.5 multiplied by 6 = 6831 ft., or a little less than $1\frac{1}{3}$ miles.

7. What is a real image? A virtual image? Why do convex mirrors form only virtual images?

Answer.—A real image is one that can be caught on a screen, while a virtual image can not, but can be seen in the mirror. Because in the convex mirror the reflected rays must be prolonged behind the mirror before they meet; hence the image is a virtual one.

8. "When a light wave passes obliquely from air into

water, its change of direction is called refraction." What causes this change of direction? Draw a diagram to represent this condition and indicate the angle of incidence, refraction and deviation. (See illustration.)



Answer.—The different densities of the media through which rays of light pass cause refraction. If a ray of light is incident obliquely on the surface M N of the water, all parts of a wave do not enter the water at the same time. Let the parallel lines perpendicular to (AO) A O represent the waves. Then one part of it will reach the water first and will travel less rapidly; the other portions on entering will be retarded in succession, the result being that the wave is swung around, or, in other words, the ray is refracted. The angle AOX is the angle of incidence; the angle COY is the angle of refraction, and the angle ROC is the angle of deviation.

9. Name and describe an instrument by means of which the presence of an electric charge can be detected.

Answer.—The electroscope is an instrument for detecting electrical charges.

It consists of a glass flask, through the top of which passes a brass rod terminating in a ball on the outside, and two strips of thin gold or aluminum foil on the inside hanging parallel and close together.

If an electrified object is brought in contact with the rod, the metal strips become similarly charged and repel each other.

10. Describe the construction of a simple voltaic cell. What is the circuit of such a cell? What the positive electrode?

Answer.—A simple voltaic cell consists of a strip of zinc and a strip of copper immersed in a glass containing a dilute solution of sulphuric acid—one part acid to twenty of water.

When the strips are brought together, bubbles of gas will be given off from the copper strip and some also from

the zinc. Remove either strip or do not allow the two to touch, the action is much diminished. If the upper ends of the two strips be connected by any good conductor, gas will come off freely from the copper.

The copper is the positive electrode.

The circuit of such a cell comprises the entire path traversed by the current.

LIST FOUR.

1. Define composition of motions, resolution of motions, equilibrant.

Answer.—Composition of motions is the combining of two or more motions into one resultant motion that is their equivalent.

Resolution of motions is to resolve one straight motion into two or more other motions that will be its exact equivalent.

A single force equal and opposite to a resultant motion is called the equilibrant of the forces or motions.

2. (a) Why are the driving wheels of a fast passenger engine made large, while those of a freight engine are made small? (b) In a lever of the second class, what resistance will a force of 50 lbs. balance, the lever being 12 ft. long and the resistance 3 ft. from the fulcrum?

Answer.—(a) In a passenger engine the result desired is speed; hence a stroke of the piston rod attached to a large wheel will cause it to pass over more space in an equal interval of time than if attached to a small wheel.

(b) P : W :: Wa : Pa. Hence, 50 : x :: 3 : 12, or x=200 lbs.

3. What is meant by the graphical and analytical methods of showing relations?

Answer.—By graphical method of showing relations is meant to make drawings to illustrate principles, while in the analytical method writing is employed.

4. Describe the manner of fixing the scale in the Centigrade thermometer. Name two other temperature scales and state their differences.

Answer.—In the Centigrade thermometer, to mark fixed points the thermometer is packed in finely broken ice as

far up the stem as the mercury extends. The containing vessel has an opening at the bottom to let the water run out. After standing in the ice for several minutes the top of the thread of mercury is marked on the stem. This is called the freezing point and is marked zero. The boiling point is marked by observing the top of the mercurial column when the bulb and stem are enveloped in steam under an atmospheric pressure of 76 cm. This is marked 100 and is called the boiling point. The space on the stem between 0 and 100 is divided into 100 equal spaces or degrees. Fahrenheit scale: Boiling point, 212; freezing, 32. Reaumer scale: Boiling point, 80; freezing, 0.

5. Describe the Leyden jar. What is the nature of the disruptive discharge?

Answer.—The Leyden jar is a form of electrical condenser. It is a thin glass jar coated about two-thirds of the way up, both inside and out, with tinfoil, connection being made with the inner coating by means of a knob and rod, to the lower end of which is attached a small chain, which rests upon the bottom of the jar. The disruptive discharge seems to shock.

6. In general, what is the difference between a motor and a dynamo?

Answer.—A dynamo is a machine designed to convert mechanical energy into electrical energy, while a motor is a machine for the transformation of electrical energy into mechanical energy.

7. Upon what does tone quality depend? When will harmony be produced? When discord?

Answer.—Tone quality depends upon the number, the relative phase and the relative intensity of the overtones which are combined with the fundamental. Harmony will be produced when the vibrations of sound producing bodies are in unison; when not in unison, discord will be produced.

8. Define reflection. Give the laws of reflection.

Answer.—When waves of light meet an obstacle in their path, they are reflected.

Law: The angle of reflection is equal to the angle of incidence.

PHYSICAL GEOGRAPHY.

Answers by Superintendent Fred S. Beard, A. B., Genoa, O.

LIST ONE.

1. What is the plane of the ecliptic? What angle does the earth's axis form with this plane?

Answer.—The plane of the ecliptic is the plane which touches the earth's orbit at every point. The earth's equator cuts the plane of the ecliptic at approximately 23° 27′. Hence the inclination of the earth's axis is approximately 66° 33′.

2. For what purpose is the earth's surface divided into zones? What is the purpose of isotherms?

Answer.—The word zone means belt. By recognizing the natural divisions of the earth's surface into zones geographers are enabled to designate the belts which possess the same general conditions as to climate, life, etc. By the use of isotherms we may compare the mean annual temperature of the places and note the effect of the various agencies which affect the influence of the sun's heat upon climate.

3. Are there greater extremes in insular or in continental climate of the same latitude? Why?

Answer.—Continental climate possesses much the greater variation, and hence shows greater extremes. This is largely due to the fact that land is a good absorber and a poor radiator of heat; but it is also a poor reflector and a poor conductor. These conditions subject the land areas to great extremes of temperature.

4. Mention at least three conditions which determine the distribution of animal life. Show how the following conform to their environment: The camel, the monkey, the llama.

Answer.—First, we recognize the locomotive power which animals themselves possess, (a) in transporting themselves, and (b) in carrying other animals or their

eggs. Then we may note that (c) the winds carry birds and insects far from their habitat, and (d) storms transport fishes and other water animals, or their eggs, long distances from their accustomed waters. Next, let us recall that (e) marine currents are responsible for the frequent transportation of life upon icefloes, trunks of trees and rafts of plant growth. And, finally, that (f) man has sometimes wittingly, other times not so, been responsible for the transportation of animal life long distances from its home. This dispersion would go on indefinitely were it not that animals reach barriers that cause their death or beyond which they cannot go. Among such barriers are, (1) other animals may already occupy a region, (2) climate may forbid a type of animal life to venture farther, (3) mountains may prove too precipitous for crossing or rivers too wide and swift. Again, (4) mountains encourage some types of animals, plains other types. (5) Water is a barrier for many kinds of animal life, and land for others. (6) The direction of prevailing winds forbids the dispersion of some animals in at least one direction. (7) The presence or absence of suitable food or means of propagation always influences the distribution of animals. (8) Forests or open country constitute an important factor, and (9) deserts or fertile regions often forbid the migration of animals.

Camels conform to their environment in having (1) callous parts upon their feet, knees and chest; (2) long, dark eyelashes, to protect from the glaring sun and from drifting sand; (3) high, oblique nostrils, that can be closed at will; (4) sharp incisor teeth in upper, and canine teeth in both jaws; and (5) a stomach that has no villi, and that has compartments in its walls, each of which may be closed and separated from other parts of the organ, or opened at the animal's need. Besides, (6) the camel has a sensitiveness that enables it to discern a supply of water to a great distance.

The llama has (1) a deeply cleft foot and long, narrow and sharp hoofs; (2) long, movable lips; and (3) a power to endure great cold and high altitudes. Both the camel and the llama have the power of long endurance without food.

The monkey has (1) a thumb which may be opposed by each of the four fingers; (2) is, hence, four handed; (3) has limbs of nearly equal length and moveableness; (4) has only one pair of mammary glands, which are pectoral; and (5) possesses a dentition showing an interval which allows the apposition of teeth to jaw when the mouth is closed. Some species have prehensile tails.

5. Give two theories as to the cause of ocean currents. Trace the course of the Japanese current and show its effects on climate.

Answer.—The varying density of sea water under different temperatures, the axial rotation of the earth, the perennial winds of the subtropical regions, and the position and contour of continents form the basis for the various theories as to the cause of ocean currents.

6. Give the location, extent, topography and adaptability to human life of the Amazon river valley.

Answer.—Spreading widely across the continent of South America and sloping sharply up to the Andes lies the valley of the Amazon, comprising the most enormous forest area of the world—more than two and a half million square miles in extent. In the upper valley are goldfields; frequently, indeed, in every state of Brazil are rich coal outcrops, and precious stones may be found in the bed-gravel of the streams. In the middle Amazon the total rubber output in 1901 was 46,992 tons, and tobacco, cacao, cotton, Brazil nuts, rice and sugar were some of the other vegetable products. There is practically no limit to the agricultural pursuits that can be followed successfully in the middle Amazon plains or in the spreading valleys and lowlands of the river and its many large tributaries. Here is a swampy jungle inhabited only by a unique tropical fauna and an occasional savage wandering through an almost impassable growth. This vast selvas, or forest swamp of the Amazon, occupies the entire heart of the continent and possesses a solid area of forest growth often formed into an almost impassable web by multitudes of creeping and climbing plants. Here is wealth of forest supreme—an almost unexploited variety of magnificent trees with most beautiful ornamental weeds, useful as well

for medicine and for commercial products. This is the broadest compact body of fertile and habitable territory that remains unimproved or even unexplored. Even more than any other country Brazil requires for the development of its vast natural resources (2500 miles broad and 4000 miles long) a mighty stream of immigration, a sweeping tide of civilization and culture and the planting of great industrial enterprises. There is no climatic hindrance science cannot solve; yet the people cling to the fringe of the continent, whilst the central fact concerning the vast Amazon valley, stretching across the continent from a few degrees north to about sixteen degrees south latitude, is that its rank vegetation defies the efforts of all casual settlers, and nothing less than a teeming population can subdue it to human uses.

7. Mention four classes of cloud forms and define each.

Answer.—The older geography classified clouds as to form only into (1) Cirrus, (2) Stratus, (3) Cumulus, and (4) Nimbus. The Cirrus is a kind of isolated featherlike cloud formation. The Stratus appears in more or less distinct and parallel bands. The Cumulus is the "cotton-ball" cloud. Any cloud from which rain is falling may be called Nimbus. Meteorologists now generally recognize a more complete classification based upon both form and altitude. The names in this classification are as follows: (1) Cirrus, (2) Cirro-stratus, (3) Cirro-cumulus, (4) Cumulus, (5) Alto-cumulus, (6) Cumulo-nimbus, (7) Stratus, (8) Strato-cumulus, (9) Alto-stratus, and (10) Nimbus. The forms from one to ten may be arranged to show all the varieties of cloud formation from a slightly cloudy sky to the deep gray rain cloud. This classification is used by the United States Weather Bureau.

8. In connection with mountains, define the following terms: Mesa, conglomerate, weathering, butte and spur.

Answer.—A mesa is a large, outstanding, level-topped section of a plateau. Conglomerate is the name of a type of rock consisting in large part of a rock or gravel bed cemented together by silica. The term is also applied to a mountain structure that lacks conformity to type. Weathering refers to the disintegration of rock from the action

of the weather. The butte is a small, outstanding, level-topped section of a plateau. A spur is a mountain range appearing as a branch from another range.

9. Give the causes of the change of seasons. Draw a diagram to illustrate the relative positions of the earth and sun at the time of the equinoxes.

Answer.—The seasons are caused to change on account of the inclination of the earth's axis to the plane of the ecliptic, and the revolution of the earth around the sun. For the diagram see any advanced geography.

10. Explain corrasion and mention the conditions under which its work is most rapid.

Answer.—Corrasion is the cutting away of the banks of a stream by bodies floating in its water. This phenomenon takes place most rapidly in times of freshets when the current is swift and the stream contains many floating objects, such as ice, logs, etc.

LIST TWO.

1. Distinguish between physical climate and astronomical climate.

Answer.—Astronomical climate is that which would result from a thoroughly uniform earth. Physical climate is astronomical climate modified by the earth's diversity. Astronomical climate is theoretical; physical climate is actual.

2. Mention five proofs that the earth is round.

Answer.—We know the earth to be round, (1) because measurement has shown it to be so; (2) because the earth's shadow is always circular; (3) because the horizon is always curved; (4) because the line of illumination is everywhere an arc of a great circle; (5) because lines supporting plumets depart from each other as the radii of a sphere; (6) because navigators have sailed around it; and (7) from the phenomena of approaching or receding objects.

3. Classify mountains according to formation and mention an example of each class.

Answer.—Some mountains, as Vesuvius, Pelee, Shasta, Popocatapetl, etc., are eruptive in origin; others, in their

present condition, as the Catskills, White mountains, Valdai hills, Grampian hills, Black Dome, etc., are the result of the destructive action of the elements; and yet others, as the Rockies, Blue Ridge, Cascade, Alps, etc., are the results of the folding of the earth's crust.

4. Why do mountains tend to produce condensation of atmospheric vapor? What effect does this condensation have upon the climate of mountain slopes?

Answer.—Warm air holds more moisture than cold air. As the air rises in passing a mountain chain it becomes cooler, and, therefore, if already saturated, loses a part of its moisture. This makes the climate of mountain sides moist, an ideal climate for forest growth.

5. What climatic conditions prevail in the zone of equatorial calms? How does this belt fluctuate?

Answer.—The zone of equatorial calms, width from four to six degrees, possesses a moist, foggy atmosphere and a sky generally overcast and gloomy. Here almost every day about 2 o'clock in the afternoon occurs a violent storm of lightning and thunder, accompanied by a great downpour of rain and fitful gusts of wind. The intense heat which follows, the myriads of insects and the strict certainty of the daily occurring rains make this zone very disagreeable to travelers and to inhabitants. This torrid belt travels northward and southward with the annual course of the sun, rarely reaching south of the equator and sometimes extending eight degrees north of it.

6. Describe the formation of mirage, waterspouts and fluviatile lakes.

Answer.—A mirage occurs when a denser upper stratum of the atmosphere, acting as a mirror, bends back again to the earth the rays of light reflected from an object, giving a more or less complete image.

Waterspouts originate in the upper atmosphere, where opposite winds, meeting, condense a great amount of vapor into a dense black cloud, to which a whirling motion is given. The rotation produces a vortex in which at least a partial vacuum exists. Now, funnel-shaped, it descends upon the sea; the water, rising, joins in the whirling motion, and the entire column travels with the wind, some-

times vertically, sometimes obliquely, to the horizon, till the water contents become too heavy to be supported, when the entire structure collapses.

Fluviatile lakes are those formed by the action of rivers.

7. Under what conditions do spring tides occur? Neap tides?

Answer.—Spring tides occur when the effects of the sun's and the moon's attractions are added. Neap tides when they are subtracted.

8. Compare the several continents with respect to indentations of the coastline. What type of coastline is most favorable to commerce? Why?

Answer.—Europe is the most indented of the continents. It has 55,000 miles of coast for 3,825,000 square miles of area, a ratio of 1:189. North America is next, in possessing 30,000 miles of coast for 9,350,000 square miles of area, a ratio of 1:312. And it is not an accident that these two continents lead the world in the value of their products and in the type of their civilizations. The exports and imports of any country give the measure of its commercial dealings with other races and reveal the intellectual activity of its own people. Let us compare Africa, coastline 16,000 miles, area 11,500,000 square miles, ratio 1:710, with Europe. The backwardness of its civilization is quickly apparent; nor would we be surprised at the difference when we observe that Africa possesses one-fifth less coastline than Europe, absolutly, and one-fourth less relatively. Little coastline, accompanied by few harbors, give little opportunity for the intellectual intercourse that arises from favorable trade conditions. Further, Australia possesses 8000 miles of coast and an area of 2,983,000 square miles, a ratio of 1:373. The figures for South America are 16,500 miles of coast and 6,939,000 miles of area, a ratio of 1:420; and, for Asia, are 35,000 miles of coast and 17,296,000 square miles of area, a ratio of 1:476. The reader may easily compare these ratios with the status of the several continents.

9. What are fossils? Of what value are they to the geographer?

Answer.—Fossils are evidences of life preserved in the rocks by natural forces. By means of fossil remains sci-

entists have been enabled to estimate the age of the earth's crust, to secure an accurate account of the progress of life upon the earth and to know much of the methods followed in perfecting the various localities.

10. Why do earthquake and volcanic regions frequently coincide?

Answer.—The fact that volcanic activity is usually accompanied by earthquake shocks has led many naturalists since Pliny's time to assert that earthquake regions and volcanic regions were co-originous. Such, however, is not the fact. The causes which produce volcanoes constitute only one of the many causes for earthquake shocks, and many earthquakes occur not accompanied by any volcanic activity. Where the two disturbances occur in the same locality the volcano is the prime disturbance and the earthquake shock is only secondary.

LIST THREE.

1. Explain the construction of a barometer. What weather conditions does a high barometer indicate?

Answer.—In preparing a barometer, select a glass tube of uniform bore and about one yard in length. One end of the tube is closed. Fill the tube with mercury and invert it, holding it vertically so that the open end is immersed in a dish of mercury. The mercury, originally filling the tube, at once falls to about the height of thirty inches, leaving a vacuous space at the closed end of the tube, such that the weight of the column of mercury exactly balances the weight of the air. Next provide a scale of some material by comparing your barometer with a standard instrument. This simple instrument will illustrate all school uses. The barometer measures the pressure of the atmosphere. Hence, when a storm is passing, "low" will indicate its center, and "high" will be shown near its edges, or in fair weather.

2. Describe and account for the climatic conditions in the trade wind belts.

Answer.—The trade winds blow constantly in one direction and with one rate. Hence, the temperatures, rainfall and the various elements that make up the climate of this

belt will not vary. This climate is constant. As the belt of trade winds moves with the advance of the direct rays of the sun different regions come into the zone, and the regions over which the zone travels has passed, experiences changeable weather until the return of the trades. This constancy of climate is caused by the constancy of the winds.

3. Give the physical geography of the Ohio river valley. Why is this river subject to great fluctuations of depth?

Answer.—The Ohio valley embraces all of what has been termed in geology "Lake Ohio." Everywhere on the hillsides can be seen the marks of the water of the old lake, and much evidence is present that the valleys have experienced much filling. In these valleys are the rivers and creeks of the present time, having worn their beds down in many places below the carboniferous strata. In other places the detritus has filled the river beds till the water now flows at an elevation considerably above its original bed. Not the least of interest centers in the peculiar coral reef a few miles above Louisville, which, being composed of hard rocks, occasions a fall of about twenty-two feet in two miles, the only serious hindrance to navigation the river possesses. The Ohio valley is long and narrow; it possesses many curves, and these, along with the frequent steep slopes, make the waters of the main stream subject to great floods.

4. Are the Alps young or old mountains? The Appalachians? How can you tell? What are block mountains? Illustrate.

Answer.—The Alps present a congeries of mountain structure that reveal to the student variant ages. From the disposition of the rocks which show the strata broken, tilted and twisted in every conceivable way the Alps seem to be the result of several "earth efforts" at mountain-making. The inner core is of granite, gneiss, hornblende and various slates and shales, probably dating from the Archaen age; yet in the western part the geologist Reclus would not date the extensive limestone formations earlier than Jurassic or Cretaceous times.

In the Appalachian mountains we are again shown a

variant mass resulting from the activities of the earth at variant times. The Catskills and the Palisades along the Hudson are doubtless of very early origin, probably Archaen. However, the other ranges of this system—if, indeed, there is an Appalachian system—indicate the result of earth movements that have little or no connection with each other.

In discussing the age of mountains we are guided first of all by the nature of the crest and slopes. Rounded crests and gentle slopes are taken to indicate "old" mountains. However, the nature of the rock material determines to a very large part the meaning of this type of slopes. A very much more reliable guide is the nature of the disturbance as indicating the condition of the earth's crust at the time of the mountain-making. Other guides are the nature of the valleys, the fossils revealed and the amount of work that can be attributed to the corroding elements of nature.

Block mountains result where an elevated plain is fractured in more than one direction. This leaves many mountain-like "blocks" standing out in prominence. To these the name of "block mountain" has recently been given. Examples may be found in northern Mexico and in Arizona and New Mexico, where the peculiar geography has originated the name.

5. Mention the principal ways in which plants migrate.

Answer.—Migration has been defined as the movement of plants in vegetation. The simple water plants, such as the algae, etc., move the entire plant by flotation. And this movement takes place partly by the current of water, but also by the selective action of the plant itself. The principle of flotation is quite noticeable in the case of flowering plants that live in or near the water. These plants surround their seeds or fruits with a corky or spongy substance that enables them to float upon the water. But most terrestial plants are fixed. These migrate by the refined spore or seed. Indeed, there are the tumbleweed and the ticklegrass that migrate by allowing the wind to roll the entire plant away. But these are not in a living condition during migration. The spores of

most non-flowering plants are transported by the wind: yet in some special cases water may help. Seeds and fruits, however, must be specially modified for migration. This is because of the weight of these forms of plant embryo life. Aside from the devices mentioned above the chief modifications are to accommodate the seed to the power of the wind and to animals. With reference to the wind, various contrivances have been worked out, such as parachutes, hairs, wings and pods, all of which increase the amount of free surface and serve to make the entire mass lighter than air. Plants which accommodate themselves to the transporting power of animals have evolved pins, hooks, spines and glands, or they have made themselves attractive by a bright, edible or enticing envelope. In the case of plants carried by animals man has played an important part in both voluntary and involuntary carriage. By him thousands of cultivated plants and many obnoxious species have been carried to places they never could have reached themselves. It is very interesting to note the individual plans that plants use to secure dissemination, but this short answer will give the student a general outline of the subject of plant migration.

6. Explain the nature of ocean deposits. How do these deposits vary with depth of the ocean and distance from the shore?

Answer.—Very unlike the land surface, the bottom of the sea receives constant accessions. In origin these have been recognized as Continental and Pelagic. And these differ as radically in nature as in origin. The continental deposits consist (1) in what the waves remove from the exposed coasts "where long lines of cliff breaking have left a chasm;" and (2) in the effluvia brought down from the valleys of the rivers, "the priceless treasures of fertile soil." These are called "mud," not that it is all fine and mixed into a heterogeneous mass as mud is upon the land, but from its origin. As the land currents move out into the ocean the coarser parts are dropped first, and as the stream is retarded the less coarse parts fall, and then the finest parts, such as fine sand, which may be carried far into the ocean. And some, indeed, of this material is al-

ways floating even to the farthest parts of the ocean. Thus it is that the continental shelf is made of the coarser materials, while the gentle slope beyond receives only the finer "mud." And beyond these the great oceanic trough has only the lightest and finest of the detritus. In this place we should not forget that the waves and tides tend to bring back this material to the land; and, that, on this account, it is only allowed to rest where the forces of the ocean and those of the land currents balance. This will account for the location of the sandbars along the south-eastern coast of the United States, and elsewhere. Again, we are confronted by curious disconnected mud or terregenous deposits when conflicting currents meet, and hence retard each other. Such a place is readily recalled as the Newfoundland Banks, where the northward-bound Gulf Stream already advancing slowly on its long journey has only fine sand to drop, thus giving the distinctive "sand-bank" character to the coast of Newfoundland, while the iceberg-laden Arctic current, as the ice is melted, drops large rocks that have filled the channel so full that they have become a real menace to navigation. Sometimes, also, these "muds" have a distinctive color, such as blue, red, yellow, green, and as such color the water and give names to the "seas" that lie over them. Or they may be coral in origin, as those in the ocean of tropical America. Animal remains may often be found in this mud, but it never predominates. Such remains are the broken shells of mollusca, and parts of the skeletons of other animals, but they are only accidental and accessory to the general structure of the deposits.

The deep-sea, or Pelagic deposits, are known as "ooze." It is almost entirely of organic origin. These constitute a kind of deposit valuable alike to the geographer, the geologist, and to the zoologist. They consist of the shells of various foraminifers, and have been classified entirely from the basis of the predominating character of the remains present, as Diatom ooze, Radiolarian ooze, Peropod ooze, Globigerina ooze, etc. For a really good discussion of animals that make up these deep-sea deposits consult "Practical Zoology," by Davison. Murray has given much

space to "Deep-sea Deposits" in his "Challenger Reports." At one time a class of scientists tried to show that ooze is the origin of life, but this doctrine has been fully refuted by Cooke in his "Boston Monday Lectures" on biology. It is now quite apparent that ooze is but the decaying remains of various living organisms.

7. What is usually the character of lakes in arid regions? Why is a stream flowing out of a lake generally clear?

Answer.—The lakes of arid regions hold brackish, or salty water, and usually shallow, and are variable in extent and area. The characteristics result from excessive evaporation which may entirely dry up the lake, leaving beds of borax, common salt, and the carbonates or nitrate of soda. And sometimes these lakes become desiccated owing to periods of drought in the valley, of the inflowing rivers; and at other times their areas are widely extended by the flooding of the rivers' valleys.

The lake serves as a resting place where the sediment deposits upon the bottom of the lake. Hence, the outflowing stream contains no sediment and is clear.

8. Give the theory of the formation of artesian wells.

Answer.—Artesian, or self-flowing wells, result when the conditions permit the emptying of a subterranean reservoir by deep drilling. Such conditions have two characteristics. First, there must be pervious strata of rock located over impervious strata. The upper rock structure may be sandstone or any loose structure to act as a reservoir. The lower prevents the escape of the water deeper into the earth. And second there must be at least a gentle incline to the lower strata. This will give force to the water when the reservoir is pierced by the drill, and hence assure the outpour of water. The outflow of these wells depends entirely upon the rainfall of a region and upon the area of the upper exposed pervious strata of rocks.

9. What is a glacier? Locate Muir Glacier.

Answer.—A glacier is a tongue of ice heading in the fine, light snow and extending, by a slow movement, far down the valley that constitutes its bed. Muir Glacier is located in Alaska. This glacier was named in honor to the Ameri-

can naturalist, John Muir, whose writings on nature have the interest of fairy tales.

10. Define each of the following: Peneplain, tundras, undertow, water gap, weathering.

Answer.—Peneplain (from Geek **pene,** almost, and **plain,** from the French) is the name given to the low-lying rolling foothills situated between a mountain range and its bordering valley.

Tundras is applied by the Russians to the mossy, frozen, half-flooded plains of Siberia. Undertow is the current of water produced under the surface of a stream by an eddy, or along the gently sloping beaches by the return of the water of the tides or waves. A water-gap is a place where a stream has eroded a passage through a range of mountains, or hills. Weathering is a term applied to the entire effect of the weather upon rock structures.

LIST FOUR.

1. Account for the differences in climate and plant and animal life between the northern and southern slopes of the Himalayas.

Answer.—This vast range extends for more than 2,000 miles in an almost unbroken line east and west, thus effectually breaking all tropical winds in their northward direction and giving an abundance of warm rain upon the southern slopes. Hence, Northern India has a vast and luxuriant tropical vegetation reaching far up the mountain side. And this both by its abundance and by its hiding places encourages animals, and more vegetation. But when the seasonal winds blow seaward the cold mountain winds descend and there is much suffering among both plants and animals. The limit of snow line on the southern slope is 16,200 feet. On the north side these mountains are exposed to the variations due to an inland climate. The seasons are erratic and rainfall scanty. Few animals are here and these are northern animals that have wandered southward and have here become acclimated.

2. Why do coast lines change?

Answer.—Waves and tides are constantly making inroads upon the coast lines. "Long lines of cliff breaking make

chasms." And on the other hand, the effects of volcanic action in many sections of the world, are noticeable in the rising and falling of the shore lines.

3. What region of the United States has the greatest annual rainfall? Why?

Answer.—The region about the mouth of the Columbia river has the greatest rainfall. Because the combined influences of ocean and ocean current, winds and their velocity, forests and forested slopes and mountains with their moisture-extracting influences make it so.

4. What are the usual peculiarities of insular climate?

Answer.—Insular climate is more equable and moist than continental or inland climate. And this is true from the great specific heat of water. The same change of heat will raise the temperature of land surfaces four times as fast as that of water. This absorbed heat of the land is held near the surface; and is consequently rapidly given off. Thus the very great variations of temperature in continental climates.

5. State two causes from which lakes may disappear.

Answer.—Lakes may disappear because they have been drained; as the immense lake that once occupied what is now the Ohio valley. Or they may have been filled up by sediment; as Lake Ponchartrain.

6. How does corrasion differ from erosion?

Answer.—Erosion is the general term for all the work done by water in tearing down earth structures. It thus includes weathering, transportation and corrasion. The term corrasion, first proposed by Russel, is now accepted as applying only to the work done in broadening and deepening a stream's channel by the material carried by the stream itself.

7. What atmospheric conditions produce fog; dew; rain?

Answer.—Fogs occur (1) when a warm current of air mingles with a cool current, (2) when a warm atmosphere rests over a cool stream, (3) when a warm ocean current flows near a cool atmosphere, (4) when a warm atmosphere comes into contact with cool soil, (5) when carbon, or dust particles floating into a moist atmosphere reduce it to sat-

uration point. In each instance of fog production the resultant atmosphere must be at saturation point. Dew forms whenever a warm, moist atmosphere allows its moisture to collect upon cool objects. The phenomenon depends entirely upon the difference in absorbing and radiating powers of various substances. Whenever the atmosphere cools, its moisture collects in small globules. When these particles of water become too heavy to be carried by the atmosphere they fall to the earth as rain.

8. Explain the formation of a canon.

Answer.—A canon is the result of a river's flowing over soft strata of rock and through a country having little rainfall. Take the Colorado is an example. Here the Rockies by their snow-capped slopes furnish a strong current over comparatively soft strata of rock. This cuts a narrow and deep channel for the river. And the absence of a marked rainfall in the region prevents the wearing down of the river's valley with its bed.

9. What effect does the rotation of the earth have upon winds?

Answer.—If the earth did not rotate the winds would blow directly from the polar regions to the tropical, and return again. But the rotation deflects the directly north or south currents into a northeast or a southeast direction. Considered further the rotation of the earth may be said to be the entire cause of winds, since it is only by rotation that all the surface of the earth may be heated and subsequently cooled. And this is the cause of winds.

10. Classify and account for the different forms assumed by the mouths of rivers.

Answer.—Where rivers empty directly into the sea there arises a constant struggle between the encroaching salt waters of the ocean and the land water supplied from the river. And the contest is one fiercely fought. Sometimes, when the sea has been entirely successful the tides and waves play havoc with the river's current, long branching fiords extend deeply into the river's valleys, giving a type of **submerged mouth.** One of these, the Sogne fiord, in Norway, extends far into the land and is so far successful in its struggle that no current is perceptible. But the con-

test is always on and the river may so far keep up its distinctive channel as to form an **estuary mouth.** The La Plata readily occurs to mind. The ocean forces may not carry away the sediment brought down by the stream; but may leave it arranged largely by the river's forces, forming an extending **finger-delta** mouth, as in the case of the Mississippi; or the sea forces may round out and arrange the materials in a rounded **crescent delta** mouth. Again, some rivers have been entirely locked in by sand bars and are compelled to expend their entire force upon an enclosed sound or bay. Such have **embayed** mouths, and the Texas, Colorado, or those rivers that flow into Pamlico and Ebermarle Sounds may be cited as examples.

LIST FIVE.

1. Describe the earth's crust. Of what is the earth's interior believed to be composed?

Answer.—The outer shell or crust of the earth is estimated to be from four to ten miles in thickness. Here take place all the rock movements that make up the phenomena of volcanic and earthquake action. No rock folding, crumpling or faulting reaches deeper. Below it rests on the centrosphere or solid interior of the earth, and in its behavior to this centrosphere the crust acts exactly as a viscous mass. Hence, below a very thin shell there can be no caves; and hence, too, the surface of the earth must conform quite closely to the shape it would have were it liquid. We have seen that the crust, or lithosphere, rests upon the centrosphere, or interior of the earth. The pressure resulting from this impact is more than thirty times the crushing strength of steel. Hence, there is great internal stress upon the earth; and, indeed, the laws of mechanics lead us to believe that whenever we have a large mass in a celestial body we are justified in applying the laws of hydrostatics to its computation, and that pressure is the dominant factor in the earth's density at no very great distance below the surface. And given time enough, and the time has been ample, this pressure would reduce the earth essentially to the shape it would have were it liquid, and this whatever its temperature. And the har-

mony of results, coming from widely collected data, has convinced geologists that, whatever the theory held to account for these results, there can be no wide variation from the accepted belief of the very great pressure, temperature, and fluidity of the earth's interior, and the eternal fitness in the order of things terrestial.

2. How were terminal moraines formed? Where is the southern terminus of glacial drift in North America?

Answer.—Terminal moraines are formed by the debris—rocks, gravel, silt, etc.,—dropped by a glacier at the end of its advance. The line of southern extension of the Glacial Drift in North America lies in the latitude of Long Island, bending northward to the western boundary of the State of New York, thence following closely the lines of the Ohio and Missouri rivers to Spokane, Washington, and thence southward only twice, in Western Montana and in Central Oregon. Alaska seems to have escaped this Great Continental Glacier.

3. What zones of temperature are there, and how are their boundaries marked?

Answer.—The following are the zones and their isothermal boundaries: The Physical Torrid zone extends northward and southward to the annual isotherm of 70°. The Physical Temperate zones from the isotherm of 70° to that of 30°. The Physical Frigid zones from 30° to the poles. Authorities differ widely in the names, extent and boundaries of these zones.

4. Illustrate by diagram, or indicate by description, the direction of the trade and anti-trade winds.

Answer.—A very splendid diagram may be found in Roddy's Advanced Geography, page 19.

5. Discuss the relative antiquity of the Himalayas and the Appalachians.

Answer.—Both of these mountain systems date from early geological time. The mass or knot of the Asiatic system shows the marks of Archean workmanship. However, the progress in mountain making has not been uniform, and signs of long rest from rock-folding activity are frequent. On the other hand while parts of the Appalachian system date from Archean time, the successive ages have

added much to the work and the process of destruction has not so far advanced in the entire outline.

6. Draw a diagram to illustrate the relative position of the earth, sun and moon at the time of the spring tides. What is a tidal wave and how is it caused?

Answer.—An cxeellent diagram may be found in Houston's Physical Geography, page 173. The tidal wave marks the onward movement of the lunar tides. It is caused by the swell of the water of the ocean due to the attraction of the moon.

7. Take your class on an imaginary visit to Niagara Falls and tell what facts of physical geography you find there illustrated.

Answer.—After having seen the Falls in our journey from the west and down the gorge, let us turn and note the broad expanse of fertile plain lying up the river to the westward. Here is the limestone terrace, the softer rocks that mark the lower level of the land of the State of New York, and of Canada. To the left is Lewiston Heights, where the rock-face forms an escarpment, showing in plain view the immense work that has been done in cutting away the hard rock that once occupied the river's bed. Look at this bold ascent of 250 feet on the Canadian side and the tight-locked river more than one-fourth of a mile wide that flows through its gorge. Here the grandeur of nature's work is more than manifest and the newness of the valley is very apparent. Coming to the whirlpool, we see the meeting of two currents at right angles, and know at once the grinding of the rocks that must take place before the gravel can reach the quiet waters below. Look above and you will see a platform of hard limestone that projects out over the river. This shows very plainly the place where the water once was and when it left its work not yet finished there remained a testimony to the vast undertaking. Scientists have been accustomed to view these rocks and the escarpment below and compute that the waters must have been at work here for at least 5000 years, and that 50,000 years would be ample to complete the entire work. You will be interested no doubt in the mighty "Thunder of Waters," and will want to see the Falls proper.

This is well; yet since we are studying today, let us keep our minds directly upon the rocks that have been exposed and the very recent time within which the work has been done. And the workman is yet at his task as if not content with having made so vast a piece. Note how level the land is and how sheer the descent of water. Here are Chippewa and Tonawanda creeks, once one, now cut by the Niagara river. Here the second limestone terrace serves to keep the immense strength of waters directly to their allotted task, and thus serves to keep the work upon the gorge below divided to a definite place. This does not conclude the many items of knowledge that our trip may bring us; but may illustrate the items that will be touched upon in any text-book in geography or geology. Equally profitable for advanced classes will be the study of the small streams in the same region; for here we can see how the immense volume of water has helped Niagara in its work by making it able to overcome obstacles they could not. Thus in Oak Orchard creek, St. Catharines, or in Ontario creek, in Canada, or in the Genessee river in New York, we can see the height of all in Niagara cut into three pieces as the water leaps over the successive strata of rock in its course down stream. Here we can see to very good advantage the upper sandstone of the Medina group, and next below it the Clinton limestone, and the largest, the Niagara limestone, gives the highest falls in these small streams. We have only studied in pieces what we saw in one great mass at Niagara, and now a short series of rapids takes us right back to the Lewiston escarpment again. You may wish to know something of the origin of the Niagara Falls. If you will recall the Great Ice Age that we have studied, and remember that when it receded it left a vast accumulation of waters which then stood more than two hundred feet above the present level of Lake Erie, and found an outlet into the Ohio river through its tributary, the Wabash. The shore lines of this vast lake can be traced for hundreds of miles in Northern Ohio, Indiana, and New York, and were chosen for highways in making our first settlements. See the history of Benton Ridge road and Sugar Ridge road in Hancock and

Putnam counties. But by and by the level of Lakes Ontario and Erie declined; then the Lewiston Heights held Lake Erie about thirty feet higher than at present till its water had cut through the lowest point in its rocks, beginning thus the very first strokes in the work now known as Lewiston escarpment. Then the falls were here. Just see what a work has been done as little by little they have receded up the river; and think that some day all the vast strata of rock will be cut out and the entire Niagara river will flow through a gorge from Lake Erie to Lake Ontario.

8. Define estuary; fault; typhoon.

Answer.—Estuary is the name applied to the broad, funnel-shaped mouth of a river, resulting where the encroaching tide washes the sediment away. A fault is the lack of conformity in rock structure that comes from slips and breaks in the strata. Typhoon is the name the Chinese give to the cyclone.

LIST SIX.

1. Explain the formation of the earth according to the nebular theory.

Answer.—The nebular hypothesis is held by some astronomers to account for the origin and shape of the bodies of the celestial system. It rests entirely upon two principles known to physics as the Conservation of Energy and the Conservation of Momentum. The hypothesis holds that the entire celestial mass was at one time united with a radius beyond Neptune's orbit, that within this mass were numerous small, solid nuclei, and that owing to gravity this mass gradually condensed about these nuclei. Now as they condensed, the temperature of the mass must have risen and at the same time currents of gas among the solid matter have been produced. Hence rotation; and as the contraction and condensation increased until by the centrifugal force becoming great enough, parts of the great mass would be thrown off to revolve in closed orbits of their own and to rotate on axes independent of the mass. Hence, the earth's origin.

2. Explain the influence of clouds upon temperature.

Answer.—Clouds interpose a covering like a blanket upon the earth. Hence, water being a poor conductor of heat, the surface under the cloud can not radiate its heat so rapidly as when not cloudy. Hence, clouds may be said to protect plants from sudden falls in temperature.

3. Describe winter weather conditions in the zone of the polar winds.

Answer.—In the zone of winter polar winds the winds are high and severe. Usually the temperature is low, often in exposed areas as low as 40° F. Immense falls of snow are common and frequently lie upon the ground far into the spring. Great suffering among man and animals is very common, as the weather is severe.

4. Explain the terms folding and faulting in connection with mountains. What are block mountains? Give illustrations.

Answer.—Folding refers to the bending of the rock layers out of their straight line of superposition. A fault results where a stratum has broken and one side slipped until there is no conformity of rock structure. Block mountains are the result of transverse fracturing of the rock structure which makes them. The mountains of Southern Nevada and New Mexico are frequently cited as examples of this kind of mountains.

5. Define water gap, mesa, ooze, medial moraine, talus.

Answer.—A water gap is a cut or break in a mountain range which permits a river to pass through it. A mesa is a large level-topped section of a plateau. Ooze is the fine, sticky mud that deposits upon the ocean bottom. A medial moraine consists of debris of boulders, etc., deposited along the middle of a glacier's course. Talus is the accumulation of rock debris that collects at a mountain's base, forming fan-like accumulations.

6. What is the theory of the exclusive occurrence of volcanoes near the oceans?

Answer.—To have a successful volcano there must first be present water in great quantities. The rocks composing the shore of the ocean are water-soaked and soft. Hence, they are flexible. The water passes through them readily, thus furnishing the very great supply necessary for the volcano.

7. With regard to rainfall, explain the following: How it is measured; what influence it has on weathering; why it is generally less in the interior of continents than on the coasts.

Answer.—Rainfall is measured by a rain-gauge, or a pluviometer. This is only a cylindrical vessel exposing a square unit of surface and closed at the top by a funnel-shaped lid. A gauge is fitted to the top and bottom by which the rainfall may be read in inches. Great rainfall softens the rocks and thus increases and encourages weathering and carrying away the loose rock material. It is greatest on the coast because they are nearer the greatest source of water supply. As the winds go inland they lose their moisture, until there is little left for the interior plains.

8. Compare the fertility of the Thibet highland with that of the plains of China in the same latitude.

Answer.—In Thibet, being an inland plain and greatly elevated, the rainfall is very light and the temperature shows the great fluctuations common to dry atmospheres. Hence, the vegetation is scanty and soil not fertile, except in the narrow valleys along the creeks. Here only, has the land been able to retain the rich alluvial deposits that have been taken from the steep slopes. Consult your maps to find that the lower course of these streams that wash away Thibet's soil is in China. Here are delta formations. Thibet's soil is here, and supporting by its immense fertlity the densest population on the face of the globe.

9. Give the life history of a river valley.

Answer.—There are two great types of river valleys. The first may be known as structural. The Rhine is a type. Here an immense fault permits a great river to pursue its course to the ocean accompanied with very little erosion. Other examples of this type may result when a rock-fold or synoline gives passage for a river; basins may arise from subsidence as from subterranean drainage; or in volcanic regions. The second great type has been called erosion valleys. Here the stream first cuts a narrow gorge for its own bed, as the Niagara and the Colorado have done, receiving their tributaries either by falls or from canons cut

like that of the main stream. The stream is swift and erosion rapidly cuts this canon wider and carries the sediment to the mouth where a delta may be in process of making. The river is in its second stage, for its fall is becoming less and its current slower. If the valley is frequented by rains the work of erosion is more general and the entire system is worn down together. As the work advances the stream approaches its base level where erosion ceases and its current becomes dead.

10. Name some factors that influence the distribution of animal life. How do these factors differ from those that influence the distribution of plant life?

Answer.—The topic of the distribution of animals is as yet not fully disposed of by scientists. Yet the fundamental elements to be observed are found in the two comprehensive statements following: (1) The northward migration of any species is restricted by the sum of the positive temperatures during the season for reproduction and growth. (2) The southern distribution of these same animals is limited by the mean temperature of the brief period during the hottest part of the year. Modifications of land and water must always be taken into account. On this topic, consult bulletins of the U. S. Department of Agriculture on "American Fauna." The literature on this topic is neither extended nor popular. The wants of animals are more varied than those of plants, and the plants are yet further hindered by their lack of locomotive powers. Generally speaking a habitat for plant life is good or bad in proportion as it possesses the factors of (a) water-content, (b) light, (c) humidity, (d) temperature, (e) wind, (f) soil, (g) physiography, (h) precipitation, (i) dead vegetation, and (h) animals. These comprise the habitat and make up the causes which affect plant life. The plant itself is the effect.

LIST SEVEN.

1. What are the differences and resemblances between cyclones and volcanoes?

Answer.—These two phenomena may be similar in that they have a heated interior. Their cause and methods are

quite dissimilar. The cyclone is the result of a highly heated area into which is rushing the surrounding currents of air. This produces a whirl, which soon begins to advance, bearing destruction in its path. The volcano, by chemical combination in its interior, produces gases which, from the pressure generated causes explosions and destruction.

2. How do the Cordilleras of South America compare with the Cordilleras of North America as to (a) general trend, (b) height, (c) evidences of volcanic action?

Answer.—The general trend is the same. Those of South America are higher. Extinct volcanoes in South America are not very numerous. Those in North America, especially from Mexico southward, are quite frequent.

3. Contrast the effects of weathering in the Nile valley with those of weathering in the Colorado River valley.

Answer.—As rain scarcely ever falls in the Nile valley weathering is almost entirely the result of the action of the wind. The sand is drifted. This keeps the river clogged and the current sluggish. We have seen how splendidly the pyramids have withstood the destructive agents of time. In the Colorado valley we find the same lack of rainfall; but the winds are not present. Hence, there is little of drifting sand, except in the extreme southern part. But the river's current is rapid. This enables it to cut deep into its bed, thus making a canon.

4. What is usually the physiography of regions in which lagoons occur? What is usually the climate of regions in which salt lakes occur?

Answer.—Lagoons are shallow, almost enclosed bays, or mouths of creeks, which occur only along low, boggy or marshy coasts. Another definition of the word gives the characteristics of the low, fringing coral reefs, or islands as the physiography of the lagoon's region. Lakes perceptibly salty require that evaporation from the surface must be great, or the lake of very old origin. Hence, we infer that a hot, dry climate would be the most favorable to their formation.

5. What is meant by the thermal equator?

Answer.—The thermal equator is the isotherm of highest temperature.

6. In a map showing the mean annual rainfall of the United States, what would you indicate as the regions of greatest rainfall? Of least rainfall?

Answer.—The region around the mouth of the Columbia river has 89.1 inches of rainfall. Florida has 76.3 inches. Denver, 14.9 inches. Flagstaff, Arizona, 24.64. Yuma, Arizona, 2.84 inches.

7. How are tides caused? What are the relative positions of the earth, sun and moon at the time of the spring tides?

Answer.—Tides are caused by the attraction of the sun and moon upon the water of the ocean. The earth, sun, and moon are in a straight line during spring tides.

8. Explain two of the following: St. Elmo's fire, mirage, aurora borealis.

Answer.—St. Elmo's fire is the silent, luminous discharge of electricity from pointed objects, such as the masts of ships, etc. The mirage is the reflection of an object upon an upper stratum of rare atmosphere. The aurora is not yet fully understood. What electrical discharges accompany it and in part explain its phenomena is well known. And yet it seems that in some way the aurora is associated with the magnetism of the earth.

9. Arrange in order of elevation and give instances of each of the following: Tableland, plateau, plain, plateau mountains.

Answer.—The highest of these are the plateau, or table mountains, bearing the combined characteristics of mountain and plateau. The Wasatch have been mentioned as plateau mountains. Tableland and plateau are defined under the same head in geography; but a plateau may be more desiccated. The Great Plains is an example. Plains are low. Consider the Mississippi valley.

10. Describe some peculiarities of animal life on the the Australian continent.

Answer.—Australia has long since attracted the attention of scientists by its peculiar animal life. This continent has no mammals except a few of the very lowest monstremata. These are the edridna, and the patypus, and these are found nowhere else. In Marsupalia this conti-

nent is very rich. These are pouched animals like the kangaroo, the wombat, and koala. Animals like these are found nowhere else except in North America. And here the opossum is of a different order. Yet Australia has more than one hundred kinds. In insects Australia has many varieties, but nothing startling to the naturalists. Birds are many and peculiar in the colors displayed and in the modified shapes of their bodies. The continent has no flesh-eating animals; hence, no bird needed to develop strong wings for flight. The legs are long and lithe for running.

LIST EIGHT.

1. Explain the terms erosion, weathering and corrasion.

Answer.—Erosion applies (1) to the wearing away of a river's bed by water, and (2) to the general wearing away of the land. Weathering is the total influence of climate upon rocks. Corrasion refers to the wearing away of a river's bank by means of the material floating in the river.

2. Classify rocks according to structure and arrangement.

Answer.—Rocks may be known as **stratified** when they are made up of layers or strata. The natural arrangement for stratified rocks is in horizontal layers; but sometimes the strata are tilted, or sloping, or by pressure they may have been folded, showing anticlines and cynclines. A second division of rocks is known as **unstratified.** These appear in mass which are always irregular. When either stratified or unstratified rocks are further changed in character the resulting rock is known as **metamorphic.**

3. Explain the origin and development of a drainage system.

Answer.—In any area considered the water which constitutes the rainfall will find the lowest level along which it will run to an outlet. Here then erosion will occur and slowly the steeper slopes will wash away and the earth which composed them will build up the valley, making a soil rich for vegetable growth. This deposited soil is known as detritus. And through this formation the stream meanders in wide flowing curves. By this stage of valley formation the length of most rivers easily divides itself

into three parts. The **upper course** is characterized by steep slopes and rapid erosion of the valley. The stream is flowing swiftly to its lower level, known as the **middle course** when the broad alluvial plain affords rich farms and is only occasionally subject to overflows. The **lower course** of the stream is frequently a dead level course, where the channel is rapidly filling with mud and other matter borne down with the current. As time goes on the river will approach a **dead level** line throughout, and the current will become dead and sluggish. The stream will then be **dead.**

4. Name and account for the various movements of the sea water.

Answer.—The water of the ocean is subject to three types of movement. The waves are successive ridges of water produced by the wind or other agitation upon surface. The tides are the periodic rising and falling of the water of the ocean. They are caused by the attraction of the sun and moon. The third type is that of currents, which are caused by the difference of temperature and the rotation of the earth upon its axis.

5. Explain the terms continental and oceanic climate.

Answer.—Continental climate is the climate of the interior of large bodies of land where the influence of the ocean is not felt. Oceanic climate is found near the ocean and is most influenced by it.

6. What constitutes the climate of a place? Name four agencies that affect it.

Answer.—The average of weather constitutes the climate of a place. It is influenced by altitude, latitude, nearness to a large body of water, and by exposure to wind, etc.

7. What are tornadoes? Where are they prevalent in America? Why?

Answer.—Tornadoes are whirlwinds of small diameter. but of immense energy. They are caused by the meeting of opposing currents of air. These cause rotating eddies which soon grow into a tornado. They are common where nature offers no opposition to the winds that blow. The western Mississippi valley is such a place.

8. What is a compass? Explain its variation.

Answer.—The compass consists of a magnetic needle nicely suspended upon a pivot, so that its point may swing over a scale marked with the points of direction. The entire arrangement is enclosed in a case suitable for protection and observation. The variation of the compass is due to the fact that the magnetic poles of the earth are not the poles of rotation.

9. Trace approximately the southern limit of glacial drift in North America.

Answer.—The southern limit of the glacial drift in North America, as marked by its Great Terminal Moraine, lies along Nantucket Island, through Martha's Vineyard and Long Island, across New York Bay and Central New Jersey, and bending northward across Pennsylvania, thence with a southern swing it crosses Ohio, and on irregularly westward and northwestward with the Upper Missouri basin. All the region north of this, except a basin in Wisconsin, was once covered by the ice sheet of the glacial period.

10. Define the following: Moraine, canon, crater, typhoon, stalactite.

Answer.—A moraine is the ridge which marks the melting limit of the ice in a glacier. A canon is the deep, steep-sided, young valley of a river. A crater is the opening in a volcano. Typhoon is the Chinese name for cyclone. A stalactite is a rock formation hanging down from the roof of a cave.

LIST NINE.

1. Describe igneous, aqueous and metamorphic rocks as to origin.

Answer.—Igneous rocks were once in a molten state, from which they have solidified through the agencies of cooling and pressure. Aqueous rocks are those that were formerly borne as sediment in water, from which they have deposited. Metaphoric rocks are those, either igneous or aqueous, which have been changed by yet further crystallization and hardening.

2. Compare the several continents with regard to elevation above sea level.

Answer.—The data given in the answer to this question

is as follows: North America, culminating point, Mt. McKinley, 20,464 feet. Continent as a whole only moderately elevated except in western part. Large and extensive low plains. South America, culminating point, Aconcaugua, 23,910 feet estimated, has greatest elevation in extreme west, from which are long, gradual slopes eastward. As a whole this continent is thought to be higher than North America. Europe, culminating point, Mount Blanc, 15,781 feet, is lower than either of the Americas, possesses only a limited mountain area as compared with its vaster expanse of plain. Asia, with Mt. Everest, 29,012 feet, as highest point of the world, its far-flung area of tableland and well-sustained mountain ranges is the highest and most rugged of the continents. Africa has Kilimandjaro, whose double snow-clad peaks are thought to be 19,270 feet high, as highest point. This continent has only moderately elevated plateaus and no striking mountain ranges. To this is added the small continent of Australia, low and nearly uniform, whose highest peak is Mount Kosciusko, only 7308 feet high.

3. What action does each of the following have upon rocks: Rainwater; frost; gravity?

Answer.—Rainwater enters the pores and crevices of the rocks, softens them, and dissolves out some parts. Hence, in time, under its influence the dissolved part is carried away while the more solid parts are scattered about as sand, pebbles, or gravel. When the water freezes the expansive force due to crystallization becomes a powerful agency in hastening the destructive effects of the water. Gravity tends to bear the loosened rock parts to the lowest level possible. Hence, gravity reduces the mountains and hills and brings the materials accumulated into the valleys.

4. What are flood plains? Locate three.

Answer.—A flood plain is that part of a river's valley which is liable to overflow during freshets. The Ohio river has an extensive flood plain. The peculiar conditions of the flood plain of the Colorado has recently obtained note. To these may be added the historic flood plains of the Nile, and of the Euphrates and Tigris.

5. How is the temperature of the air determined? Why is mountain air cooler than air at sea level?

Answer.—By a thermometer. Mountain air is not so dense, contains less vapor, does not generally receive the sun's rays so directly, and is more exposed to breezes.

6. Define terminal moraine; alluvial plain; cumulus cloud.

Answer.—Terminal moraine is a term applied to mass of boulders, etc., which marks the end of a glacier's advance. An alluvial plain is built from the materials carried by rivers. Cumulus clouds possess a round "cotton-ball" shape.

7. Mention three ocean currents and describe the course of one of them.

Answer.—The Gulf Stream, Equatorial Current, and cold Arctic Currents may be mentioned. The Arctic Current of the Atlantic Ocean originates to the westward of Greenland, washes the shores of Labrador, Newfoundland, and New England with its cold waters, and is lost near the latitude of New York.

8. Describe the rainfall and climate of the zone of trades.

Answer.—The zones of trades possess those peculiar constant winds in all open lands or continents. This characteristic extends to about 30° north and south of the equator, and blow, south of the equator, to the southeast, and north of it to the northeast. These winds average but about two miles in depth, and on them are superposed the anti-trades. Rain is slight except on the windward slopes of the mountains where the ascending currents lose vast loads of moisture.

9. Describe with explicitness the peculiar fauna of Australia.

Answer.—The fauna of Australia possesses more than a hundred forms of marsupials, thus almost entirely displacing the mammals. Some of the marsupials to be found here are the kangaroo, the wallabies, wombat, koala, bandicott, phalangers, opossum, and dasyures. The native dog or dingo is common. Here are the peculiar and lowest animals of the mammal class, the platypus, and the echidna.

Australia is now rich in domestic animals from all lands. This continent possesses a varied bird life, embracing the large awkward emer, the cockatoo, the magnificent lyre-bird, the black swan, the ostrich, and many others. Here, too, are many frogs, lizards, alligators, etc. Insects are numerous and varied.

10. Describe a cyclone in the tropics, as to cause and motions.

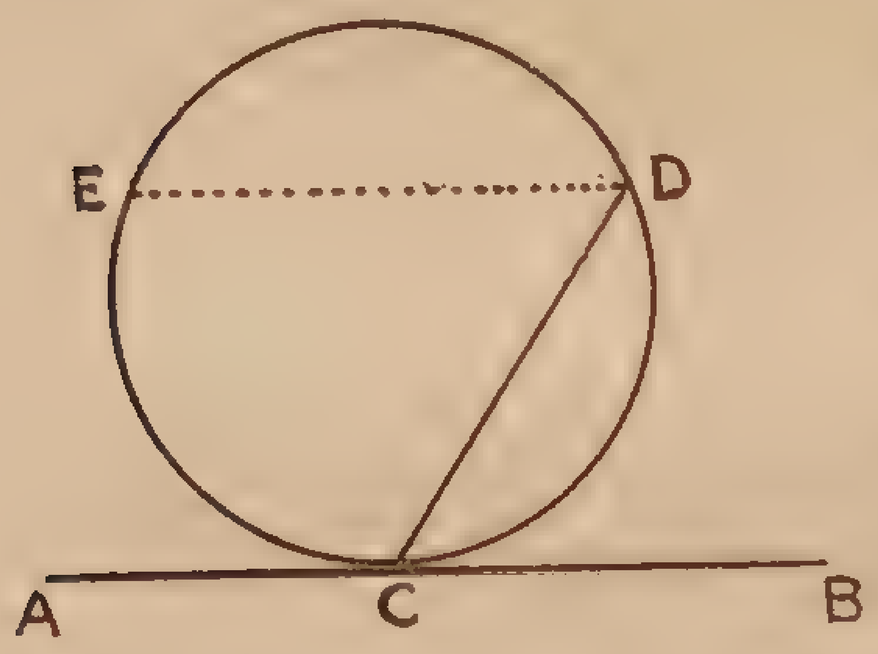
Answer.—Tropical cyclones are immense rotating and progressing storms with a diameter sometimes as great as five hundred miles and often progressing as rapidly as thirty miles an hour. This double motion makes these storms quite dangerous, while the dense, rapidly-forming rain clouds deluge the area over which they pass. These storms originate in the tropics, yet they are often carried far into temperate regions.

GEOMETRY.

Answers and Solutions by Edson M. Mills, Ph. M., Professor of Mathematics, State Normal College, Ohio University, Athens, Ohio.

OCTOBER, 1906.

1. Prove: An angle formed by a tangent and a chord is measured by one-half the intercepted arc.



Solution.—Let ECD be any circle, AB a tangent and DC a chord. We are to prove that angle DCB is measured by ½ arc DC.

Proof: Draw DE parallel to AB. Then, ang. D=DCB. and arc EC = arc CD.

But ang. D is measured by ½ arc EC. ∴ ang. DCB is measured by ½ arc EC, or its equal, ½ arc DC.

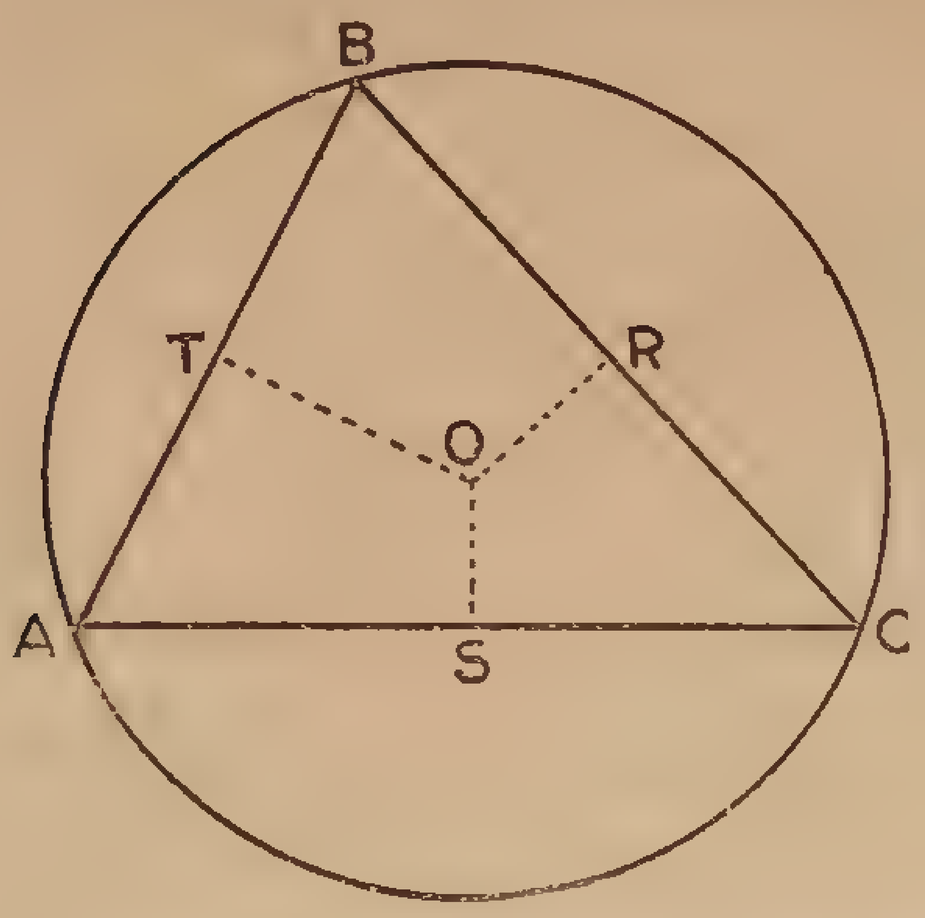
2. When are two quantities commensurable? When is a straight line divided in extreme and mean ratio?

Answer.—(a) Two quantities are said to be commensurable when they have a common unit of measure.

(b) A straight line is divided into extreme and mean ratio when one segment is a mean proportion between the whole line and the other segment.

3. Circumscribe a circle about a given triangle, prove your construction and mention two other problems for which the same construction will serve.

Solution.—(a) Bisect AB, BC, AC. Erect perpendiculars at these midpoints. It has been proven that these perpendiculars will meet at a point O, equidistant from the vertics of the triangle. Then, with radius OB describe the circle, which is the circle required.



(b) Through three points, not in the same straight line, one circumference can be drawn, and only one.

(c) A circumference is determined by three points.

4. How many sides has a polygon, the sum of whose interior angles is double that of its exterior angles?

Answer.—The sum of the interior angles of any polygon is $(2n - 4)$ right angles, where n is the number of sides of the polygon. The sum of the exterior angles of any polygon made by prolonging the sides in the same order is always 4 right angles $\therefore$ $2n - 4 = 8$

$$2n = 12$$

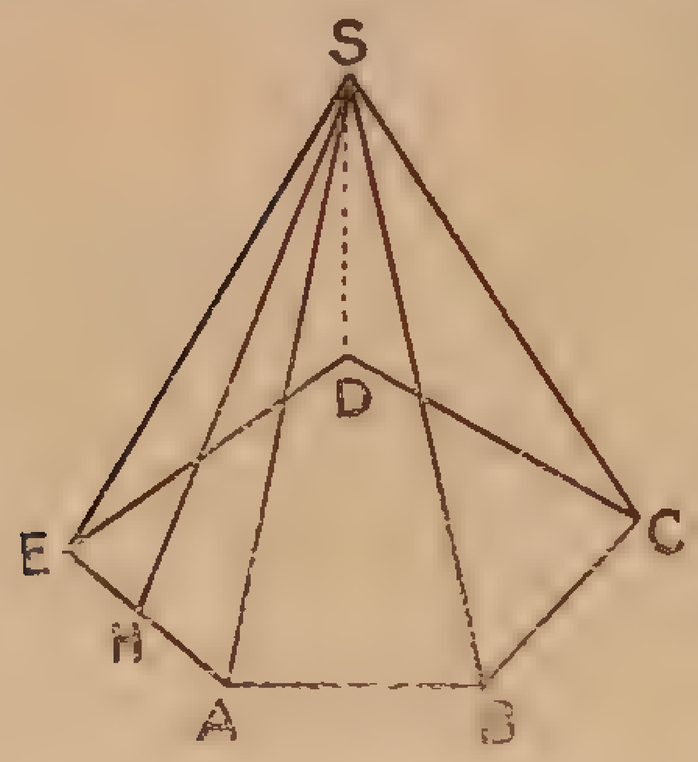
$$n = 6,$$ number of sides of the polygon. $\therefore$ The required polygon is a hexagon.

5. The bases of a trapezoid are 8 feet and 10 feet, and the altitude is 6 feet. Find the base of an equivalent rectangle having an equal altitude.

Solution.— $\frac{8+10}{2} \times 6 = 54$ sq. ft., area of the given trapezoid. Since the area of a rectangle is equivalent to the product of its altitude by its length, we have $54 \div 6 = 9$ ft., length of the required rectangle.

6. Prove: The lateral area of a regular pyramid is equal to one-half the product of the slant height by the perimeter of its base. State a corollary to this proposition.

Solution.—Since the lateral faces are equal isosceles triangles, then area SAE=AEX½SH, area SAB=AB×½SH, etc.



Adding these equations, we have, lateral area S — ABCDE = (AE + AB + BC + CD + DE) × ½SH.

Cor.—The lateral area of the frustum of a regular pyramid is equal to half the sum of the perimeters of its bases multiplied by the slant height of the frustum.

7. Show that the lateral faces of right prisms are rectangles.

Answer.—By definition a right prism is one whose lateral edges are perpendicular to its bases. Therefore the lateral faces must be rectangles.

8. Draw to represent a truncated triangular prism; an isosceles trihedral angle; a great circle of a sphere.

Answer.—See any standard geometry.

9. Find the lateral area, the total area and the volume of a cone of revolution, the radius of whose base is 7, and whose slant height is 25.

Solution.—$7\times2\times\pi=14\pi$, the circumference of the base. Then $14\pi\times25=325\pi$, the lateral area of the cone. And $14\pi\times\frac{7}{2}=49\pi$, area of the base. ∴The total area is $325\pi+49\pi=374\pi$. $\sqrt{(25^2-7^2)}=24$, altitude of cone.

$$\frac{274\pi\times24}{3}=2992\pi, \text{ volume of cone.}$$

10. Complete the following proposition: If in a right triangle a perpendicular is drawn from the vertex of the right angle to the hypotenuse:

Answer.—If in any right triangle a perpendicular is drawn from the vertex of the right angle to the hypotenuse:

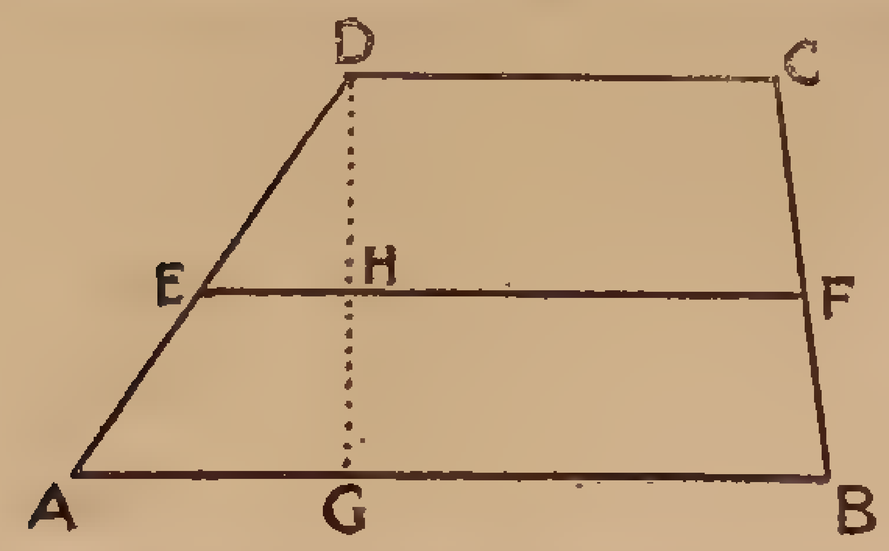
I. The perpendicular is a mean proportional between the segments of the hypotenuse.

II. Each arm is a mean proportional between the hypotenuse and the adjacent segment.

JANUARY, 1907.

1. Define trapezoid and prove one proposition with regard to this figure.

Solution.—(a) A trapezoid is a quadrilateral having two of its sides parallel.



(b) An intercept parallel to the base of a trapezoid and bisecting one of the non-parallel sides bisects the other also.

Proof: In the trapezoid ABCD, draw DG parallel to BC, meeting AB and EF in G and H respectively. Since in triangle DAG, EH is parallel to AG and bisects AD, it also bisects DG in H. But BH and HC are parallelograms, ∴ BF = GH and FC = HD or GH. ∴ BF = FC.

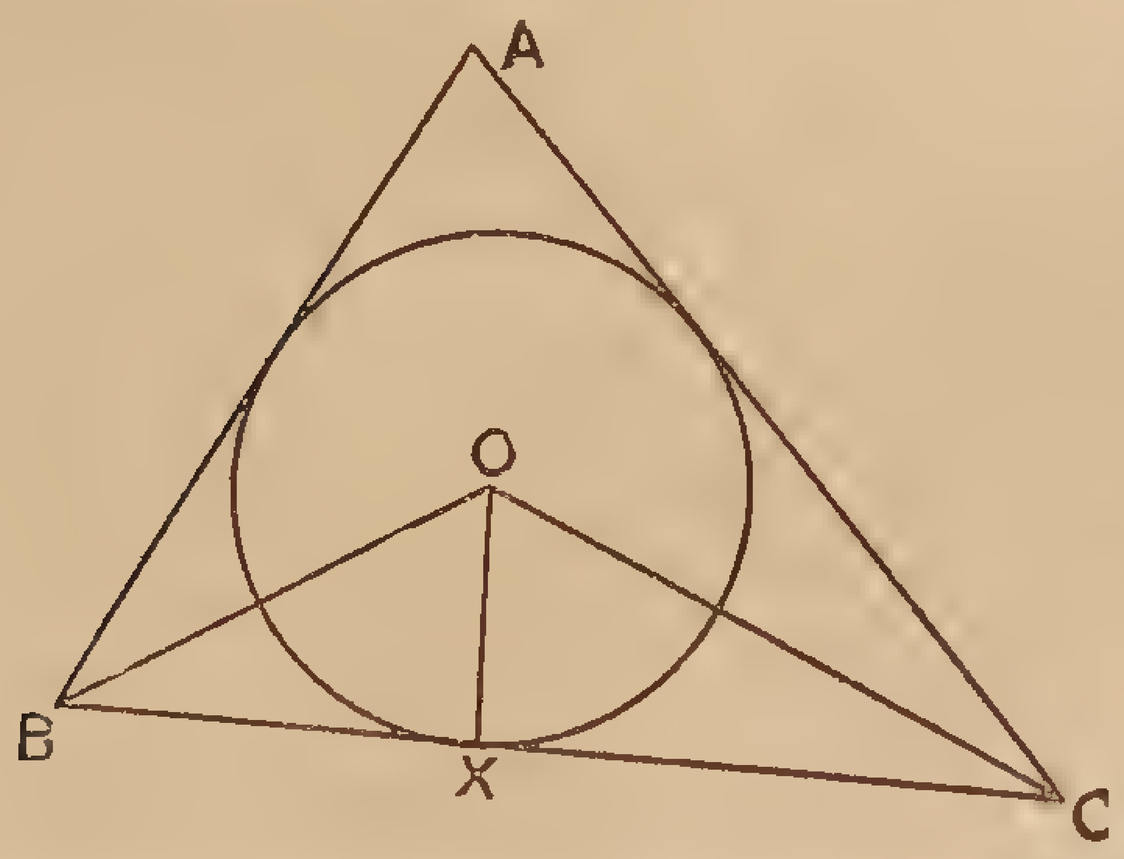
2. State three postulates concerning straight lines.

Answer.—(a) Straight lines that coincide in part coincide throughout.

(b) Two points determine a straight line.

(c) Two straight lines intersect in only one point.

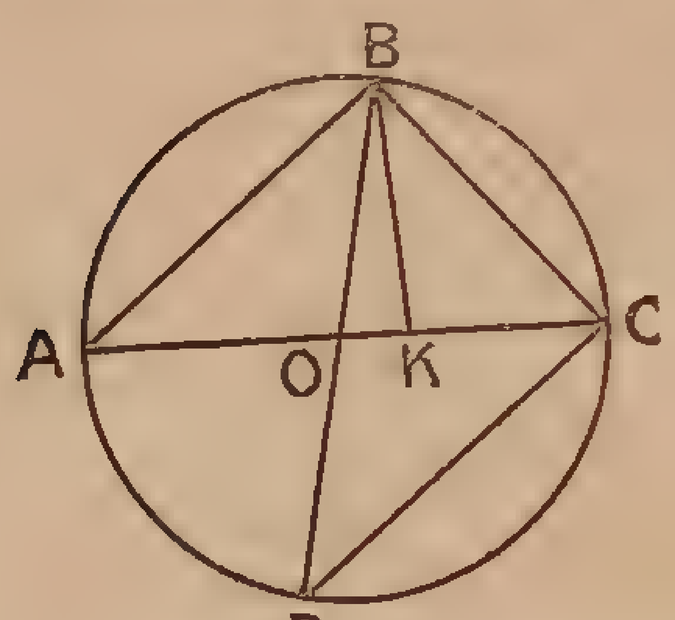
3. Inscribe a circle in a given triangle and prove your construction.



Proof.—In the triangle ABC, bisect ang. B and ang. C. Since the bisectors of a triangle meet in a point equidistant from the sides, the point O is the center of the required circle. Now, with a radius OX, the perpendicular distance to any side, describe the circle, which is the required circle.

4. Draw the figure to be used in demonstrating the fol-

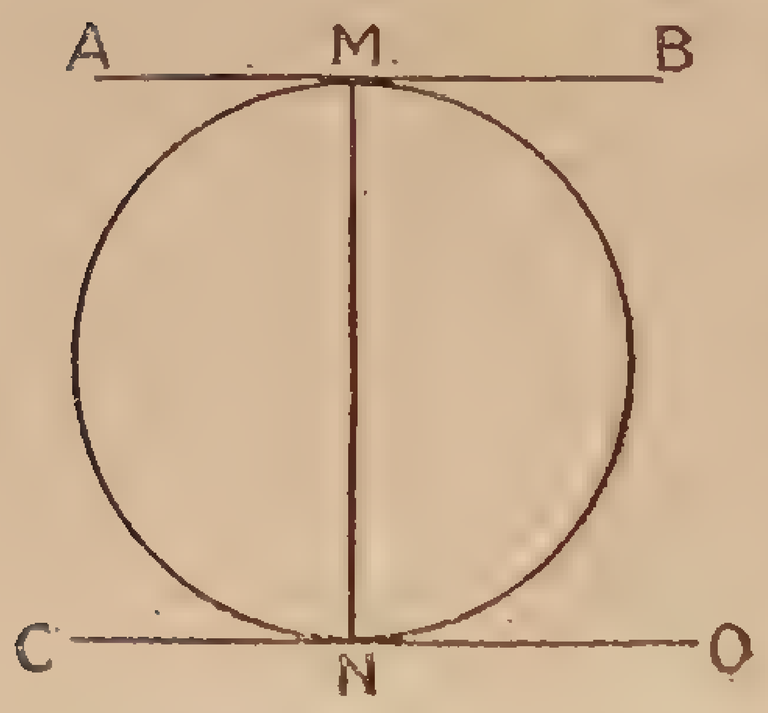
lowing proposition: In any triangle, the product of two sides is equal to the product of the diameter of the circumscribed circle by the altitude upon the third side.



Proof.—Draw diameter BO and chord OD. Ang. BCD=rt. ang. In rt. triangles ABK and BCD ang. A=D. ∴these triangles are similar.

∴ AB : BD :: BK : BC.

Consequently, BC . AB=BD . BK.



5. Show that the tangents drawn through the extremities of a diameter are parallel.

Proof.—Since AB is tangent to circle at M, the extremity of the diameter, it is ⊥ to MN. Likewise CO is ⊥ to MN. Two lines ⊥ to same line are parallel to each other. ∴ Tangent AB is parallel to tangent CO.

6. State two corollaries to the following proposition: The area of a circle is equal to one-half the product of its radius by its circumference.

Answer.—(a) The area of a circle is equal to square of diameter multiplied by $\frac{\pi}{4}$.

(b) The area of a circle is equal to square of the radius multiplied by π.

7. Upon the diagonal of a rectangle 24 feet by 10 feet a triangle equivalent to the rectangle is constructed. What is its altitude?

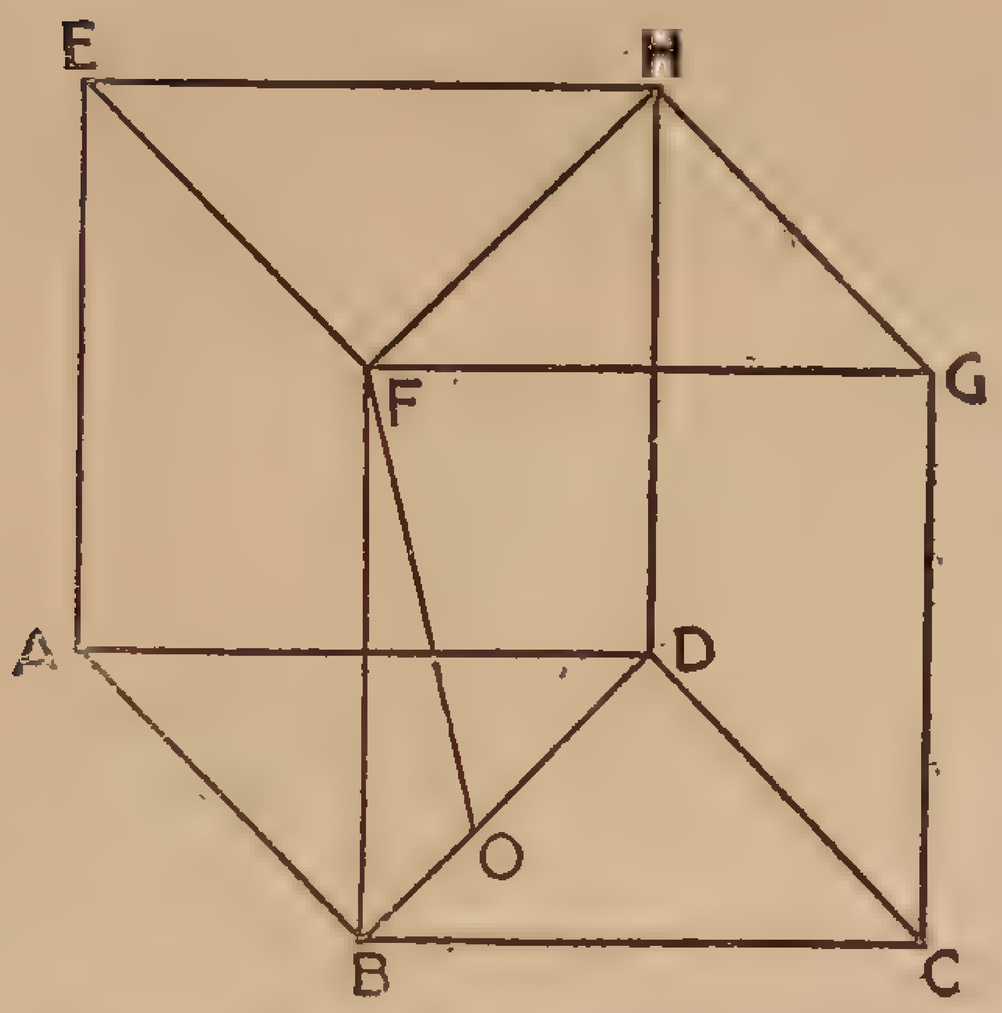
Solution.—$\sqrt{(24^2+10^2)}=26$ ft., base of required triangle.

$10\times24=240$ sq. ft., area of rectangle, or area of required triangle.

Since twice area of a triangle divided by its base gives its altitude, we have, $480\div26=18\frac{6}{13}$ altitude.

8. Illustrate the following: Convex polyhedral angle; icosahedron; slant height of frustum of a cone of revolution.

Answer.—See any standard geometry.



9. Prove: The volume of a triangular prism is equal to the product of its base by its altitude.

Solution.—Let ABD-E be any triangular prism, with its altitude FO.

Then complete the parallelopiped ABCD—E.

Then, Vol. ABD—E = ½ Vol. ABCD—E. But, ½ Vol. ABCD—E = ½ABCD ×FO.

Hence, Vol. ABD—E = ABDXFO.

10. Find the volume, in cubic feet, of a regular pyramid whose base is a regular hexagon, each side measuring 8 feet, and whose height is 40 feet.

Solution.—The apothem of the hexagonal base is $\frac{8.\sqrt{3}}{2} =$ 6.9282 ft. Area of base is $\frac{6.9282 \times 48}{2} = 166.2708$ sq. ft.

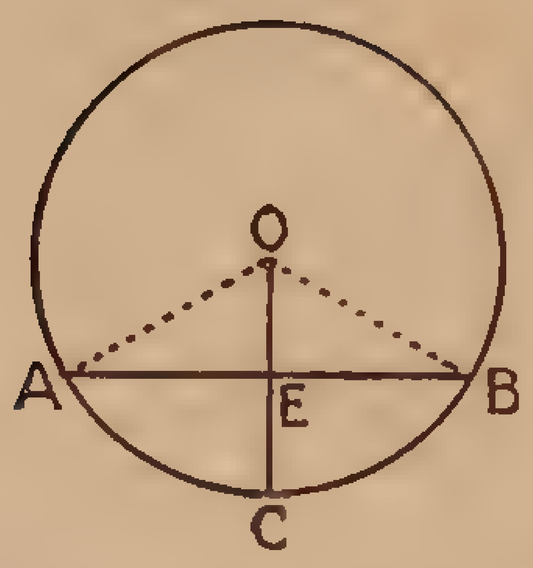
$\frac{166.2768 \times 40}{3} = 2217.024$ cu. ft., the volume as required.

MARCH, 1907.

1. Name and illustrate five kinds of triangles.

Answer.—See any standard geometry.

2. Prove: The radius perpendicular to a chord bisects the chord and the arc subtended by it.



Solution.—Let O be any circle, AB a chord and OC a radius perpendicular to AB. To prove AE equals EB and arc AC equals arc BC: Draw the radii AO and BO. Then AO = BO, and the triangle AOB is isiscles. Then, since OC is equal to AB, it bisects AB and the angle AOB. Hence, ang. AOC= ang. BOC, and arc AC=arc BC.

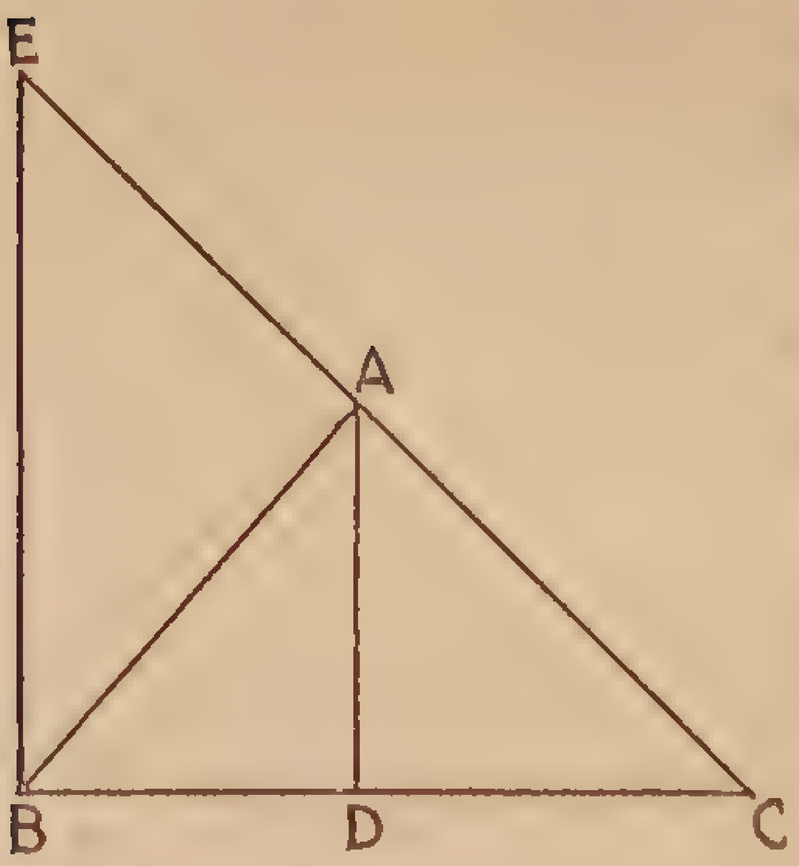
3. What is the measure of an inscribed angle? A central angle? An angle formed by two intersecting chords?

Answer.—(a) An inscribed angle is measuered by half its intercepted arc. (b) A central angle is measured by the intercepted arc. (c) An angle formed by two intersecting chords is measured by half the sum of the intercepted arcs.

4. Describe the position of two circles if (a) the line of centers equals the sum of the radii, (b) the line of centers is less than the difference of the radii.

Answer.—(a) They will be tangent externally. (b) They will be tangent internally.

5. Prove: The bisector of an angle of a triangle divides the opposite side into segments proportional to the other two sides.



Solution.—Let ABC be any plane triangle, with AD the bisector of angle BAC. To prove BD is to DC as AB is to AC:

Through B draw a line parallel to DA, meeting CA produced at E. Then angle ABE=ang. BAD

ang. ABE=ang. CAD

ang. ABE=ang. AEB

$\therefore$ AE = AB

Now, BD : DC = EA : AC

$\therefore$ BD : DC = BA : AC.

6. Find the locus of a point at a given distance from a given circumference.

Answer.—The locus of a point at a given distance from a given circumference is the circumference of a circle whose center is the same as that of the given circle, and whose radius is the radius of the given circle plus the distance of the point from the given circle. Or the required locus may be the circumference of a circle whose center is the same as that of the given circle, and whose radius is the radius of the given circle, minus the distance of the point from the given circle.

7. Find the area of the convex surface of a cone the diameter of whose base is 6 feet and whose altitude is $8\frac{1}{2}$ feet.

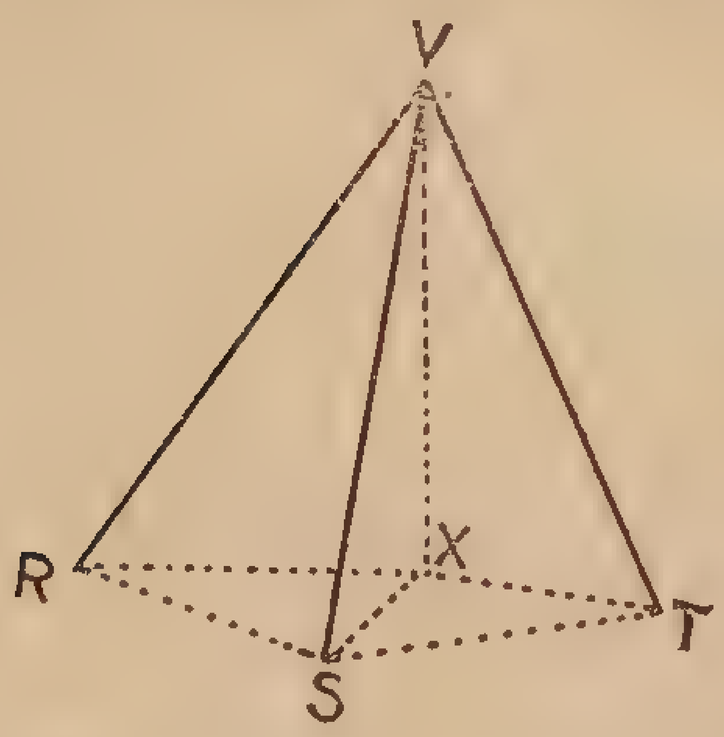
Solution.— 6π=circumference of base in feet.

$\sqrt{[(8\frac{1}{2})^2+3^2]}=\frac{5}{2}\sqrt{13}$, the slant height in feet.

$\therefore \frac{1}{2}\times 6\pi\times\frac{5}{2}\sqrt{13}=\frac{15\pi}{2}\sqrt{13}$, the convex surface in square feet, as required.

8. Prove: If two face angles of a trihedral angle are equal, the dihedral angles opposite them are equal.

Solution.—Let V-RST be any trihedral angle, with the face angle RVS equal to the face angle SVT.

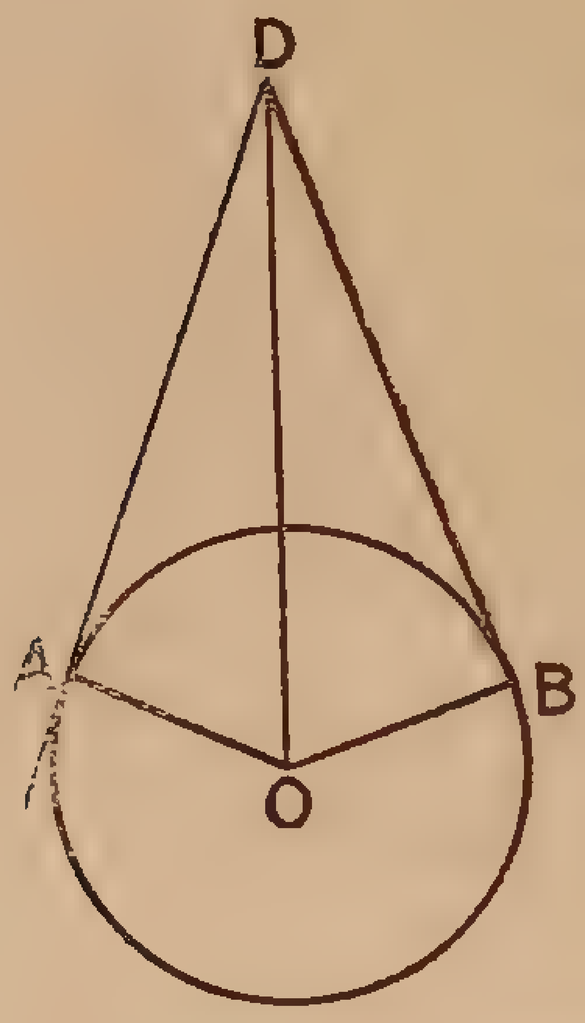


To prove that the dihedral angle RV is equal to the dihedral angle VT:

Pass a plane VXS bisecting the dihedral ang. VS. Then, since the two trihedral angles V — RXS, V—TXS have the two faces angles SVX and SVT and the included dihedral angle respectively equal to SVX and SVR and the included dihedral angle they are equal in every respect.

$\therefore$ The dihedral ang. VR = dihedral ang. VT.

JULY, 1907.

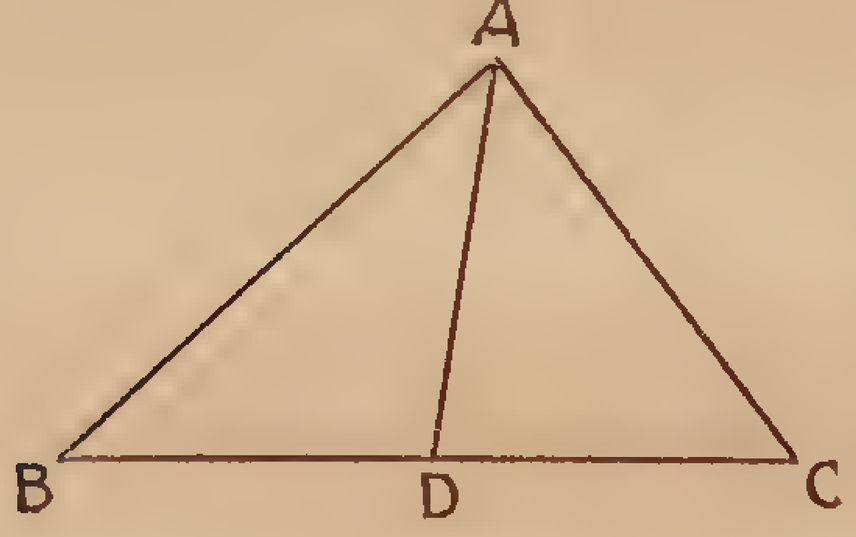


1. Prove: The tangents to a circle drawn from an exterior point are equal and make equal angles with the line joining the point to the center.

Proof.—Let PA and PB be tangents drawn from P to the circle whose center is O. Join OA, OB. Since OAP, OBP are right angled triangles, with hypotenuse OP common, and OA = OB, right.

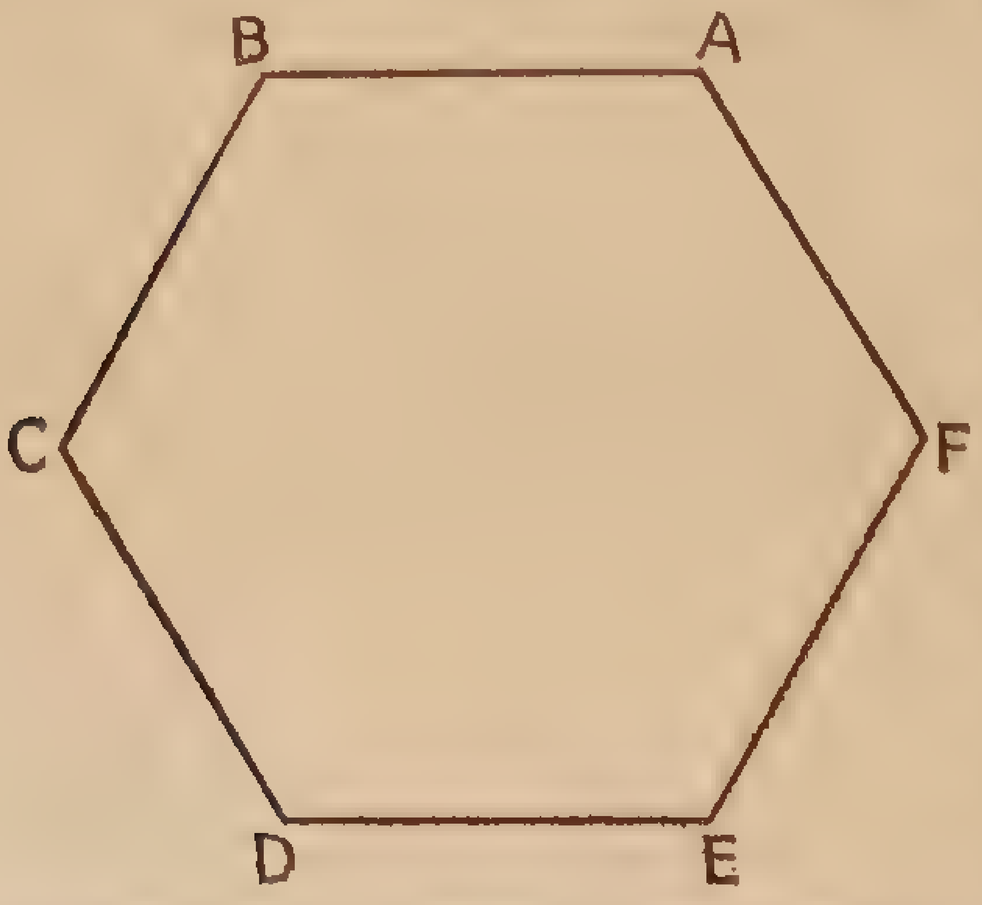
Triangle OAP = right triangle OBP
∴ PA = PB. Ang. APA = ang. BPO.

2. Problem: Divide one side of a given triangle into segments proportional to the adjacent sides.



Proof.—In triangle A B C, draw AD, the bisector of the angle C A B, and meeting the side B C in D. Then, BD : DC = BA : AC. For proof, see Problem V, March list.

3. Prove: The sum of the angles of any polygon is equal to two right angles taken as many times, less two, as the polygon has sides.



Proof.—In a polygon of n sides, from any vertex, as A, draw lines to C, D, etc. Since, except the two that meet at A, each of the n sides of the polygon is the base of a triangle having its vertex at A, the number of triangles is n-2; the sum of the interior angles of the triangles is n-2 times two right angles. ∴ the sum of the

interior angles of the polygon is n-2 times two right angles.

4. State two corollaries to the above proposition.

Answer.—(a) If the sides of a polygon be produced going around in the same order, the sum of the exterior angles thus formed is equal to four right angles.

(b) Each interior angle of an equi-angular polygon is equal to $\left[\frac{n-2}{n}\right]$ 2 right angles.

5. The length of the tangent to a circle, whose diameter is 80, from a point without the circumference, is 42. What is the distance of the point from the center.

Answer.—If the point from which the tangent is drawn be joined with the center of the circle and a radius drawn to point of tangency, we have a right triangle, to find the hypotenuse. Hence, $\sqrt{(42^2+40^2)}=46+$, required distance.

6. Tell when a line is divided in extreme and mean ratio internally? Externally? Illustrate.

Answer.—A straight line is said to be divided in extreme and mean ratio when one segment is a mean proportion between the whole line and the other segment. When the point of division falls within the line, it is said to be divided internally; if the point falls without the line it is divided externally.

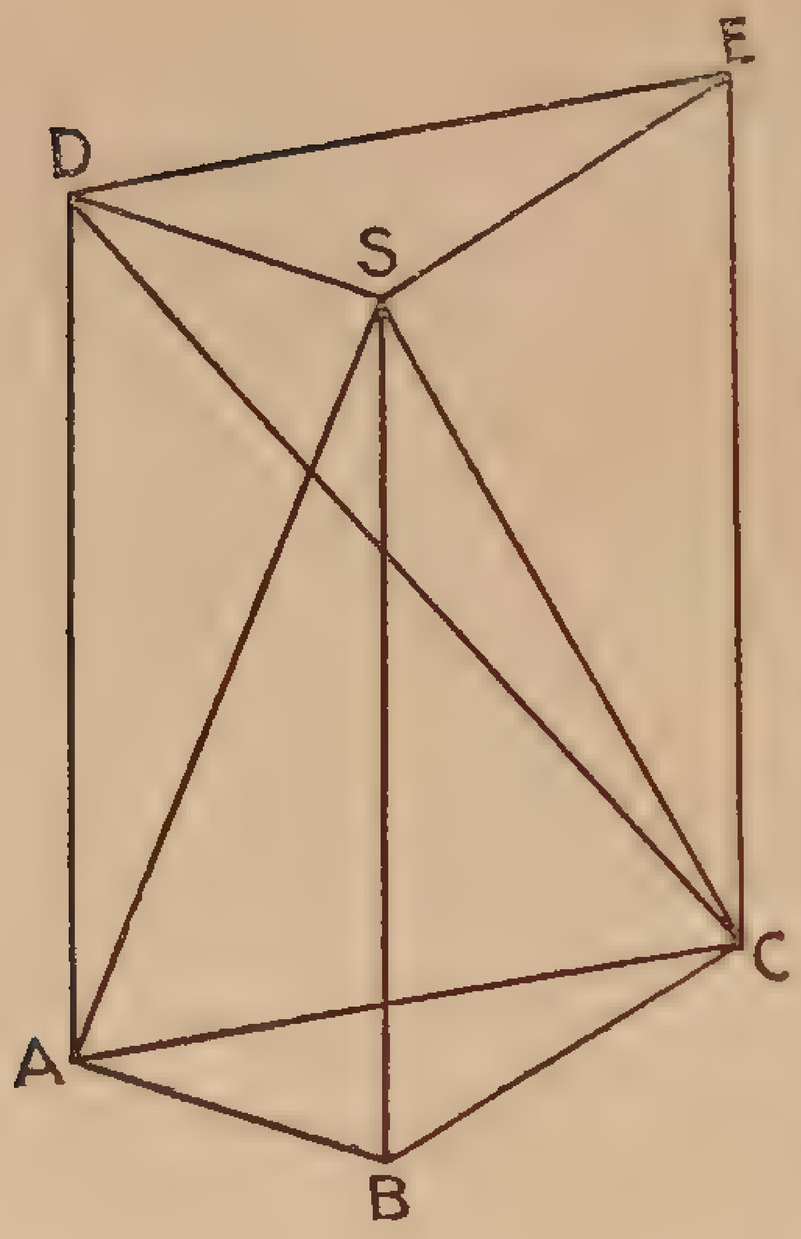
7. Find the area of the sector of a circle whose radius is 15 inches, the angle of the sector being 32°.

Solution.—$15^2\times\pi=225\pi$ area of circle. $\frac{32}{360}$ or $\frac{4}{45}$ = part enclosed by the sector. $\therefore \frac{4}{45}$ of $225\pi=20\pi$, area of sector.

8. Prove: The volume of a triangular pyramid is equal to one-third the product of its base and altitude.

Demonstration.—Given the triangular pyramid S-ABC, to prove that its volume is one-third of its base ABC by its altitude.

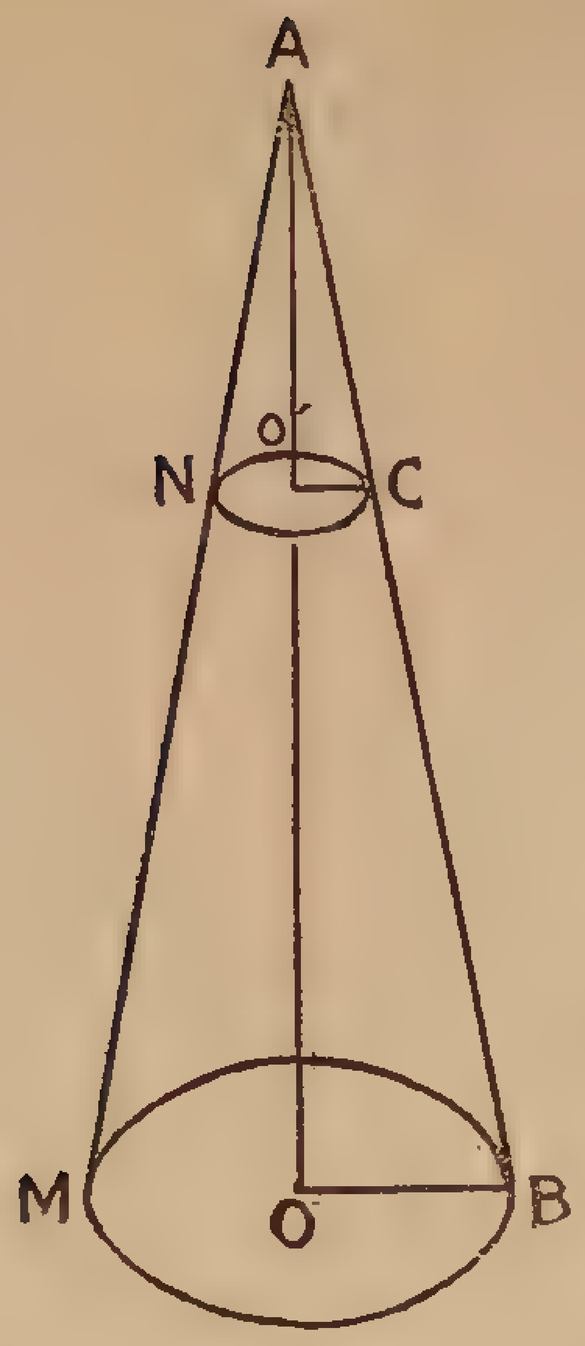
Construct a triangular prism having ABC for its base and its lateral edges equal and parallel to BS.



Taking away the triangular pyramid S-ABC from the prism, we have left the quadrangular pyramid S-ADEC. Now divide this quadrangular pyramid by the plane DSC into two triangular pyramids S-ADC and S-DCE. These pyramids have equal bases in the triangles DAC and DCE, and they have equal altitudes in the perpendicular from the common vertex S upon the common plane of their bases. Hence they are equivalent. In the same manner it may be shown that pyramids S-ABC and S-DAC are equivalent. Therefore all three pyramids are equivalent. Hence the pyramid S-ABC is one-third of the prism. But the volume of the prism is the product of its base by its altitude; and since the pyramid has the same base and altitude, its volume is one-third of the product of its base by its altitude.

9. From a right circular cone whose slant height is 30 feet, and the circumference of whose base is 10 feet, there is cut off by a plane parallel to the base a cone whose slant height is 6 feet. Find the convex surface and volume of the frustum.

Solution.—Let A-OMB represent the cone of the problem, and A-NO'C the small cone cut off by a plane parallel



to the base. This small cone is similar to the large cone. Hence we have,

10 : 30 :: x : 6. $\therefore x=2$ ft., circumference of base of small cone. Then, we have,

$\frac{10\times30}{2}=150$ sq. ft., convex surface of cone A-OMB, and $\frac{2\times6}{2}=6$ sq. ft., convex surface of cone A-O'CN. Then, 150 sq. ft. — 6 sq. ft. = 144 sq. ft., convex surface of the frustum.

$OB=\frac{10\div3.1416}{2}=1.59$ ft. Then,

$\sqrt{900-(1.59)^2}=29.95$ ft., altitude of large cone.

$(1.59)^2\times3.1416=7.9422+$ sq. ft., area of base of large cone.

$\frac{7.9422\times29.95}{3}=79.289+$ cu. ft., volume of cone A-OBM.

1.59 : 30 :: x : 6. $\therefore x=\frac{6x1.59}{30}=.318$ ft., radius of

$\therefore x=\frac{29.95\times.318}{1.59}=5.99$ ft., altitude of small cone.

$(.318)^2\times3.1416=.31769$ sq. ft., area of base of small cone. Then,

$\frac{.31769\times5.99}{3}=.6343$ cu. ft., volume of small cone.

79.289 — .6343 = 78.6547 cu. ft., volume of the frustum.

10. Draw to represent a spherical polygon; indicate its diagonal. In what units are the values of the sides of a spherical polygon usually expressed?

Answer.—(a) For figures see any standard geometry.

(b) Arcs of great circles, expressed in degrees, minutes and seconds.

STATE EXAMINATION FOR LIFE CERTIFICATES, DECEMBER, 1907.

ARITHMETIC.

1. The sum of two numbers is 546, their G. C. D. is 21, and the difference of the other two factors is 8: find the numbers. 2. At what two times between 4 and 5 o'clock are the minute and hour hands of a clock equally distant from 4? 3. Certain employes, having a nine-hour day, strike because of a proposed reduction of 10% in wages. They resume work at the same wages, but have a longer day. If the increase in time is (to the firm) equivalent to the proposed cut of 10%, by what per cent. are the hours increased? 4. A dealer sells an article at a gain of 10%. Had he paid for it 16⅔% less and sold it for 7 cents less he would have gained 25%. Find the cost. 5. A man agrees to pay $6000 for a lot in three equal payments, including 6% interest on unpaid money. What is the yearly payment? 6. A lady buys 20 yards of cloth for $20. For some she pays ¼ of a dollar a yard, for some ½ of a dollar a yard, and for the remainder $4.00 a yard. How many yards of each kind did she buy, providing she bought a whole number of yards of each? 7. A board is 6 inches wide at one end and 18 inches wide at the other end. If it is 16 feet long, how far from the shorter end must it be cut, parallel to the ends, to divide it into two equal parts? 8. A man has a square tract of land which contains as many acres as it requires rails to build a fence around it. If the fence is four rails high, and the rails are 12 feet long, how many acres are in the field? 9. Pure ground mustard contains 35% of oil. A sample of mustard is adulterated with wheat flour. The per cent. of oil found in a sample is 15. Find the per cent. of wheat flour in the mixture, allowing 2% of oil to exist naturally in wheat flour. 10. The true discount of a certain sum for one year is 15/16 of the interest. Find the rate.

GEOGRAPHY.

1. State four causes contributing to the wearing away of land. 2. What is (a) dune, (b) a moraine, (c) an atoll, (d) a canyon? 3. Account briefly for (a) the rainless coast of South America, (b) the dryness of the climate of Colorado, (c) the Desert of Sahara, (d) the frequent occurrence of fogs off Newfoundland. 4. State causes of (a) deltas, (b) salt lakes, (c) geysers, (d) icebergs. 5. Make an outline map of the United States, indicating chief mountain ranges, river systems and lakes. 6. How would you teach the meaning and use of a map, and how would you give

children the idea of scale? 7. Name the Atlantic rivers which have large deltas. The Pacific rivers. The Indian rivers. 8. Show how the study of geography involves almost every branch of natural science. 9. Discuss the following from a geographical standpoint: (1) Why the Norwegians have long been a seafaring people; (2) why the Chinese have devolved into such an exclusive nation. 10. Name the five most populous countries of Europe, the capital city and form of government of each.

RHETORIC.

1. Mention several classes of words not in "good use." What are the three requirements of "good use"? 2. What was the original meaning of "shall"? Of "will"? Discuss the use of these words in questions. 3. Define (a) split infinitive, (b) double negative, (c) translation English, (d) squinting construction, (e) mixed metaphor. 4. Mention the different kinds of wordiness and explain each. 5. Distinguish between the terms euphemism and euphuism. What was the origin of the latter term? 6. What is an elegy? Name three of the greatest elegies in English verse. 7. Define (a) rhyme royal, (b) Alexandrine, (c) masculine rhyme, (d) Spenserian stanza, (e) sonnet. 8. What are the marks of a good figure? Make a list of the figures founded on resemblance.

CIVIL GOVERNMENT.

Subject: Federal Constitution, its history, compromises, text, amendments and names of ten of its authors.

THEORY AND PRACTICE.

1. What preparation for teaching have you made? Where educated, and where have you taught? 2. Discuss the principle of self-activity. 3. What should be the educational policy of Ohio? 4. Name five educational measures passed by the Seventy-seventh General Assembly. 5. What are the provisions for compulsory education in Ohio? 6. What constitutes a good teacher? 7. Write not less than 100 words on some live educational topic.

PHYSICS.

1. Give the laws of motion. 2. Give Pascal's law. 3. How find the specific gravity of solids? Of liquids? Of gases? 4. Give the laws of electrostatics. 5. Discuss electromotive force. 6. A stone is thrown horizontally from the top of a tower 257.28 feet high, with a velocity of 69 feet per second. Where will it strike the ground? 7. A 1500-pound safe is to be raised five feet. The greatest power that can be applied is 250 pounds. Give the dimensions of the shortest inclined plane that can be used for that purpose.

PSYCHOLOGY.

1. Define psychology and state the objects to be attained in its study. 2. What preparation have you made in this branch? Name books read. 3. What is judgment, intuition, reason, concept? 4. Distinguish between sense and acquired perceptions. 5. Write not less than 200 words on some phase of this subject.

ALGEBRA.

1. Factor:
(a) $x^2-b^2-2xy+y^2$.
(b) $49b^4-11b^2c^2+25c^4$.
2. Find L. C. M. of a^2+ab+b^2, a^3-b^3, and $a-b$.
3. Five years ago A's age was $2\frac{1}{3}$ times B's. One year hence it will be 1 4/9 times B's. How old is each now?
4. Find the value of x, y, z, t and u in
(a) $3x+4y+z=35$.
(b) $3z+2y-3t=4$.
(c) $2x-y+2t=17$.
(d) $3z-2t+u=9$.
(e) $t+y=13$.
5. Simplify $4\sqrt{3}+7\sqrt{1\frac{1}{3}}-5\sqrt{1\frac{1}{3}}$.
6. Simplify $\dfrac{a+x+\sqrt{(2ax+x2)}}{a+x-\sqrt{(2ax+x2)}}=b$.
7. (a) $x^2+y^2+4\sqrt{(x^2+y^2)}=45$
(b) $x^4+y^4=337$
} find x and y.
8. A merchant bought a piece of cloth for $147, from which he cut off 12 yards which were damaged, and sold the remainder for $120.25, gaining 25 cents on each yard sold. How many yards did he buy? How much did it cost per yard?

TRIGONOMETRY.

1. The sine of a certain angle is 1-4. Find the other trigonometrical ratios of the angle. 2. Trace the change in sign and magnitude in the tangent of an angle, as the angle increases from 0° to 360°. 3. Express the cosine of half an angle in terms of the sine of the angle, and explain the double sign. 4. Define sine, cotangent, and prove that $\sin^2 a+\cos^2 a=1$. Express the other trigonometrical ratios in terms of the cosine. 5. Demonstrate: In any triangle, the square of any side is equal to the sum of the squares of the other two sides, minus twice their product into the cosine of their included angle.

GEOMETRY.

1. Demonstrate: In the triangle C A B the bisector of the angle C makes with the perpendicular from C to AB an angle equal to half the difference of the angles A and B. 2. Demonstrate: The shortest chord that can be drawn

through a given point within a given circle is perpendicular to the diameter which passes through the point. 3. Demonstrate: The sum of the squares of the segments of two perpendicular chords is equal to the square of the diameter of the circle. 4. Demonstrate: If the middle points of two adjacent sides of a parallelogram are joined, a triangle is formed which is equivalent to one-eighth of the entire parallelogram. 5. Demonstrate: In an isosceles right triangle either leg is a mean proportional between the hypotenuse and the perpendicular upon it from the vertex of the right angle. 6. Find the locus of a point equidistant from the three faces of a trihedral angle. 7. The frustum of a right circular cone is 14 feet high, and has a volume of 924 cubic feet. Find the radii of its bases if their sum is 9 feet. 8. A cube whose edge is 12 inches long is transformed into a right prism whose base is a rectangle 16 inches long and 12 inches wide. Find the height of the prism, and the difference between its total surface and the surface of the cube.

GENERAL HISTORY.

1. What are some of the marked characteristics of Egyptian civilization? 2. Contrast the Hebrew and Greek civilizations. 3. What was the Zend-Avesta, the Odyssey, the Laocoon, the Oration on the Crown, the Inquisition, the Cid, the Nibelungendied, the Commedia? 4. What was the issue and what the result of each battle: Mycale, Marathon, Salamus, Issus, Arbela, Cinnae, Hastings? 5-6. Classify the famous men of Greece and Rome. Tell briefly for what each is noted. 7. Characterize Julius Caesar (a) as a man, (b) as a statesman, (c) as a general, (d) as an author. 8. Subjects: The Renaissance. 9. Feudalism. 10. Name, give dates of reign and the chief events of some of the most noted of the English kings.

POLITICAL ECONOMY.

1. Name a few eminent writers of economics. 2. What has been your preparation in this subject? 3. Name five motives to human action. 4. Define wealth, value, capital, revenue, tariff. 5. What are the factors which enter into the fixing of rates of interest in the different states? 6. Discuss the interdependence of capital and labor. 7. From what sources do counties, states and the nation secure revenues? 8. What is credit currency? Give examples? What restrictions are put upon this form of money?

READING.

Discuss specifically and fully your teaching of Whittier's "Snowbound" as a lesson in reading.

SCIENTIFIC TEMPERANCE.

1. What purpose is to be kept in mind in temperance instruction? 2. Give an outline or plan for giving effective instruction in scientific temperance. 3. What is your opinion of the use of charts showing the effects of alcohol on the various organs of the body? Give reasons. 4. Describe the process of fermentation. What is the chemical composition of alcohol? 5. Trace alcohol through the body, stating what changes take place. 6. How does cigarette smoking affect the lungs? The heart? 7. Why is alcohol said to have an immoral effect?

PHYSIOLOGY AND HYGIENE.

1. Define: Physiology, anatomy, histology, rachitis, alveolus, astigmatism, hemiopia, presbyopia, myelin. 2. Define: Hemoglobin, nystagmus, hemophilia, hysteria, anemia, antidote, antitoxin, lymphatics, antiseptics. 3. Illustrate graphically myopic and hypermetropic conditions. What is the remedy in each case? 4. Compare the red and white corpuscles as to origin, number, size, form and function. 5. Give the philosophy of seeing, hearing and tasting. 6. What instruction in hygiene would you give to pupils in the elementary schools? 7. Give treatment for each case of poisoning: Carbolic acid, strychnine, arsenic. 8. Give physical properties, chemical composition and physiological action of the following: Gastric juice, saliva, bile. 20%.

LOGIC.

1. Define logic and judgment. 2. Classify propositions as to quality and quantity. 3. Explain the terms, extension and intension. 4. Give the laws of opposition. 5. What is the quantity of the subject and predicate in each of the propositions A, E, O, I? 6. Give the primary laws of thought. 7. State the rules of the syllogism. 8. Give the four figures of the syllogism. 9. Define and illustrate the term "sorites." 10. Define and illustrate the illicit process of the major term.

GERMAN.

1. Illustrate in German sentences three uses of the genitive with verbs; three uses of the subjunctive. 2. Mention five points in German grammar likely to cause trouble to English-speaking pupils, stating the rule or principle governing each. 3. Show how each of the five points mentioned in 2 may be effectively taught. 4. Distinguish between translating and reading without translating. Point out the value and place of each in high school work. 5. Name eight German poems suitable for committing to memory by high school pupils, giving the author of each. 6. Give three German words translated by the English

when." Explain and illustrate in a sentence the difference in the use of each. 7. Write a German sentence having normal word order. Make the necessary changes in it to illustrate two kinds of word order and name each. 8. Rewrite in German, changing the direct to indirect discourse: Und es versetzte darauf die kluge, verständige Hausfrau: "Vater, nichte gerne verschenk' ich die abgetragene Leinwand; Denn sie ist zu manchem Gebrauch und fur Geld nicht zu haben, wenn man ihrer bedarf. Doch heute gab ich so gerne Manches bessere Stuck an Uberzugen und Hemden. Den ich hörte von Kindern und Alten, die nackend dahergehn. Wirst du mir aber verzeihn? Denn auch dein Schrank ist geplundert. Und besonders den Schlafrock mit indianischen Blumen, von dem feinsten Kattun, mit feinem Flannelle gefuttert, gab ich hin; er ist dunn und alt und ganz aus der Mode."

9. Translate:

Wer sich des Kindes Haupt zum Ziele setzte,
Der kann auch treffen in das Herz des Feinds.
Die armen Kindlein, die unschuldigen,
Das treue Weib muss ich vor deiner Wut
Beschutzen, Landvogt!—Da, als ich den Bogenstrang
Anzog—als mir die Hand erzitterte—
Als du mit grausam teufelischer Lust
Mich zwangst, aufs Haupt des Kindes anzulegen—
Als ich ohnmachtig flehend rang vor dir,
Damals gelobt' ich mir in meinem Innern
Mit furchtbarm Eidschwur, den nur Gott gehort,
Dass meines nächsten Scnlusses erstes Ziel
Dein Herz sein sollte—Was ich mir gelobt
In jenes Augenblickes Höllenqualen,
Ist eine Heil'ge Schuld—ich will sie zahlen.

10. Hermann had fallen in love with Dorothea, and his father's words hurt him deeply, for he feared his choice would not please him. But Hermann's father allowed the pastor and the druggist to accompany Herman to the next village to inquire about Dorothea. They were satisfied with what they heard, and Dorothea, who likewise had fallen in love with Hermann, returned home with them. Dorothea pleased the innkeeper very much. The pastor betrothed them with the same rings with which Hermann's parents had been engaged.

BOTANY.

1. Distinguish between Morphology and Plant Physiology; Ecology and Economic Botany. 2. (a) State in full what takes place in germination. (b) Describe the structure of a grain of Indian corn. 3. (a) What is osmosis, and of what importance is it in plants? (b) Name the three kinds of vegetative organs. 4. Define hybridization, de-

ciduous, monoecious, dioecious, cleistogamous. 5. (a) Give a classification of the vegetable kingdom based on relationship. (b) Tell of the habits of ferns, and their mode of reproduction. 6. (a) Give two ways in which pollination is effected. (b) Give five means of seed dispersal. 7. By what physical process and through what parts is water absorbed into plants, and what are its various uses? 8. What is the importance of carbon to the plant? How obtained? 9. Mention at least five of the characteristics of living protoplasm. 10. State three functions of leaves. Draw and name a leaf which illustrates palmate venation: pinnate venation.

CHEMISTRY.

1. What are the acids, bases and salts? How is the name of a salt derived from that of an acid? 2. Write the chemical symbol for each of the following: Manganese-dioxide, sodium carbonate, potassium nitrate, Glauber's salts, blue vitriol. 3. Define allotropism and give the allotropic forms of C and O. 4. Outline the manufacture of coal gas for illuminating purposes, and mention two of the useful by-products. 5. State two ways in which the analysis of H_2O may be effected. Give the composition of H_2O by volume and weight. 6. Give the properties of copper and describe a process of obtaining copper from one of its ores. 7. Explain the explosion of gunpowder, the smoking of a lamp, the burning of lime. 8. How is Cl obtained? Explain the reaction. Give the most remarkable chemical properties of the substance. Mention its physical properties. 9. Complete the following reactions: $KCl + NaNO =$ $NaCl + H_2SO_4 =$ $4HCl + MnO_2 =$ $Zn + 2HCl =$ $CaC_2 + 2H_2O =$ $NH_4Cl + NaNO_2 =$ 10. Define electrolyte, cathode, anode, cation, ionization, filtrate, reaction.

ENGLISH LITERATURE.

1. (a) Write of the ways in which composition and the study of Literature may be correlated. Illustrate from the study of some suitable piece of literature. (b) What distinct aims should be kept in view by the high-school teacher of literature? Of composition? 2. Make an outline for a composition on one of the following subjects: (a) The penance imposed upon the Ancient Mariner. (b) The redemption of Hector's body. (c) The trial of Rebecca, the Jewess. (d) The character of Silas Marner. (e) The preludes in the Vision of Sir Launfal. 3. Characterize the Elizabethan Age. Make a list of the important writers of the Elizabethan Age, with the most important work of each. 4. Write a brief sketch of the life of Shakespeare. Name in order of their excellence six of his productions. Give two choice quotations from his writings. 5. State briefly the plot in "Merchant of Venice." Write a brief criticism of the character of Portia. A brief de-

fence of Shylock. 5 Speak of Samuel Johnson as to (a) works, (b) character, (c) personal peculiarities, (d) biography. 7. Name the works in which the following characters are found: Uncas, Gratiano, Will Wimble, Ramona, Silas Lapham, Ophelia, Uriah Heep, Hester Prynn, Richard Coeur de Lion, Alice Pyncheon. 8. Quote from four of the following: Lowell, Whittier, Burns, Pope, Milton, Emerson. 9. Name some important facts each in the life of Scott, of Irving, and of Shakespeare, that influenced their literary career. 10. Mention two standard works you have read in each of the following departments of literature: Fiction, criticism, oratory, drama, history. 11. Who wrote Utopia? She Stoops to Conquer? Sesame and Lilies? Locksley Hall? Hudibras? Don Quixote? The Spanish Gypsy? Sartor Resartus? The Gold Bug? (Answer any ten of above questions.)

GEOLOGY.

1. Define geology, and name the general divisions of the subject. 2. What is drift? What evidence in New England of the thickness of the ice-sheet during the glacial period? 3. Upon what common model are the continents constructed? 4. Define the term rock geologically. What three groups of minerals constitute the principal ingredients of common rocks? 5. Define shale, granite and marl. 6. Name at least five of the most important geological agencies. 7. Name the most valuable mineral of S. E. Ohio; N. W. Ohio. What are the most important uses of each? 8. In what geological time and era are we living? 9. Name and briefly describe four of nature's geological wonders in North America. 10. What works on this subject have you read? Who was Edward Orton?

HISTORY OF EDUCATION.

1. State four of the leading ideas in Froebel's educational system. Discuss one of these. 2. What two influences of John Sturm's school would you mention as most prominently retained in our larger schools? In what ways are these influences good? In what way harmful? 3. What constitutes the teacher's duty as viewed by Pestalozzi? What aim of education determined all his practice and method? 4. In what respects does the German system of education excel as regards provision, and as regards results? 5. What have been the notable steps in the progress of popular education in England during the present century? 6. Give Herbert Spencer's idea of the following: (a) Relative value of knowledges. (b) What education should do for us. (3) The use of history and how it should be written. 7. (a) What did Plato regard as the aim of elementary education? (b) What did Aristotle say is the object of education? In what sense is it true? 8. Indicate the main characteristics of ancient Roman education.

Name the three most prominent Roman writers of education. 9. State the view of Rousseau on these points: (a) Early education; (b) child study; (c) the cultivation of the senses; (d) self-teaching. 10. For what reasons has Montaigne an honorable place in the history of education? Erasmus? Jacatot? Basedow? 11. Who wrote the following educational classics: (a) "The Republic"? (b) "The Schoolmaster"? (c) "Leonard and Gertrude"? (d) "The Education of Man"? (e) "Orbus Pictus"? (Answer any ten of above.)

SCIENCE OF EDUCATION.

1. Explain the terms (a) "learning through self-activity"; (b) "things before words"; (c) mental discipline"; (d) "harmonious development"; (e) "method-whole." 2. What did Rousseau mean by "education according to nature"? Describe or illustrate a method of instruction that you regard as not "according to nature." 3. What is meant by "inductive teaching"? "Deductive"? Sketch out a lesson on the Condensation of Vapor, employing the inductive method. 4. In what does moral or ethical education consist? State means of providing such education in school, and indicate how they may be employed. 5. What is interest in the educational sense? What kinds may be distinguished? Lay down and illustrate three general rules to guide the teacher in securing the interest of his pupils. 4. "Everything that enters the human understanding is introduced by the senses."—Rousseau. Draw from this statement corollaries to be kept in view by the practical teacher. Illustrate. 7. Explain the meaning of the following terms: Adolescence, apperception, the humanities, concept, sense, perception, instincts. 8. Explain the meaning of "mechanical" and of "judicious" methods of remembering. Are mechanical methods always to be avoided? Give reasons. 9. Give two characteristics of a proper question for developing work. Illustrate. 10. What are the distinctive natures of work, and play? What their relation to each other in school life? Should work ever be treated as if it were play?

U. S. HISTORY INCLUDING CIVIL GOVERNMENT.

1. State the terms of the Treaty of Paris, 1763. 2. Give that part of the Ordinance of 1787 which relates to education; to slavery. 3. In what year were the Articles of Confederation adopted by Congress? Why did Maryland refuse to ratify this instrument till 1781? In what way did it prove defective? 4. What distinguished generals have been unsuccessful candidates for the presidency? Successful candidates? 5. State the compromises of the constitution that were a result of slavery. What amendments to this instrument resulted from the same source? 6. Give the Presidential Succession. 7. Name and give the

place and date of the three greatest National Nominating Conventions in our history. Give reasons for your answer. Who was nominated in each case? 8. Place an estimate upon the public services of Lincoln. What was his policy of reconstruction? 9. State the salient points in the careers of Dr. Marcus Whitman, William H. Seward, and Gen. Sam Houston. 10. State what you consider to be the great problems, which are before our nation for solution.

ENGLISH GRAMMAR.

1. Indicate, by example, the different uses of what and as. 2. Whatsoever ye shall ask in my name, that will I do. Construct whatsoever and that. 3. Place an estimate upon the value of the study of English Grammar, and distinguish between it and the study of English. 4. Give the abridged forms of adverbial clauses with an example of each.

As o'er all the mountains towering high,
The Himalayas pierce the orient sky,
Kissed by the morning sun's first rising beams,
While round their heads his evening glory streams,
So while Lincoln stands despite his lowly birth,
O'ertopping all the great men of the earth;
Raised up and set apart by God's own hand,
To be the Moses of our age and land,
Through a rebellion's red and angry sea,
He led a Union forth and made it free.

5-6. Classify and construct as, o'er, kissed, while, so, despite, raised, to be, Moses, and free. 7. Write the participles of do, be, have, sit, and set. 8. Analyze or diagram:

My country! 'tis of thee,
Sweet land of liberty,
Of thee I sing.

Alas for him who never sees
The stars shine through his cypress trees!
Who, hopeless, lays his dead away,
Nor looks to see the breaking day
Across the mournful marbles play!
Who hath not learned in hours of faith,
The truth to flesh and sense unknown,
That Life is ever Lord of Death,
And Love can never lose its own.

9. Name the author and give briefly the thought in the above selection. Explain the meaning of the second line; of the fourth and fifth lines. 10. Construct the words in bold face in the following: I seem **to have been only** like a boy, playing on the seashore, and **diverting** myself in **now** and then finding a smoother pebble or a prettier shell **than ordinary, whilst** the great ocean of truth lay **all undiscovered** before me. N. B.—Your penmanship will be graded from your manuscript in this subject.

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